



**STANDARD DREDGE AND FILL
WETLANDS PERMIT APPLICATION**
Water Division/Land Resources Management
Wetlands Bureau
[Check the Status of your Application](#)



RSA/Rule: RSA 482-A/Env-Wt 100-900

APPLICANT'S NAME: NH Dept. of Transportation **TOWN NAME:** Madbury

Administrative Use Only	Administrative Use Only	Administrative Use Only	File No.:
			Check No.:
			Amount:
			Initials:

A person may request a waiver of the requirements in Rules Env-Wt 100-900 to accommodate situations where strict adherence to the requirements would not be in the best interest of the public or the environment but is still in compliance with RSA 482-A. A person may also request a waiver of the standards for existing dwellings over water pursuant to RSA 482-A:26, III(b). For more information, please consult the [Waiver Request Form](#).

SECTION 1 - REQUIRED PLANNING FOR ALL PROJECTS (Env-Wt 306.05; RSA 482-A:3, I(d)(2))	
Please use the Wetland Permit Planning Tool (WPPT) , the Natural Heritage Bureau (NHB) DataCheck Tool , the Aquatic Restoration Mapper , or other sources to assist in identifying key features such as: priority resource areas (PRAs) , protected species or habitats , coastal areas, designated rivers, or designated prime wetlands.	
Has the required planning been completed?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Does the property contain a PRA? If yes, provide the following information:	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
<ul style="list-style-type: none"> • Does the project qualify for an Impact Classification Adjustment (e.g. NH Fish and Game Department (NHF&G) and NHB agreement for a classification downgrade) or a Project-Type Exception (e.g. Maintenance or Statutory Permit-by-Notification (SPN) project)? See Env-Wt 407.02 and Env-Wt 407.04. 	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
<ul style="list-style-type: none"> • Protected species or habitat? <ul style="list-style-type: none"> ○ If yes, species or habitat name(s): Blanding's turtle, northern black racer, spotted turtle ○ NHB Project ID #: NHB21-2175 	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
• Bog?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
• Floodplain wetland contiguous to a tier 3 or higher watercourse?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
• Designated prime wetland or duly-established 100-foot buffer?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
• Sand dune, tidal wetland, tidal water, or undeveloped tidal buffer zone?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Is the property within a Designated River corridor? If yes, provide the following information:	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
<ul style="list-style-type: none"> • Name of Local River Management Advisory Committee (LAC): <input type="text"/> • A copy of the application was sent to the LAC on Month: <input type="text"/> Day: <input type="text"/> Year: <input type="text"/> 	

irm@des.nh.gov or (603) 271-2147

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SECTION 4 - APPLICANT (DESIRED PERMIT HOLDER) INFORMATION (Env-Wt 311.04(a))		
If the applicant is a trust or a company, then complete with the trust or company information.		
NAME: NH Dept. of Transportation		
MAILING ADDRESS: PO Box 483		
TOWN/CITY: Concord	STATE: NH	ZIP CODE: 03303
EMAIL ADDRESS: Kirk.Mudgett@dot.nh.gov		
FAX: [REDACTED]	PHONE: 603-271-1598	
ELECTRONIC COMMUNICATION: By initialing here: KM, I hereby authorize NHDES to communicate all matters relative to this application electronically. <i>KOM</i>		
SECTION 5 - AUTHORIZED AGENT INFORMATION (Env-Wt 311.04(c))		
<input type="checkbox"/> N/A		
LAST NAME, FIRST NAME, M.I.: [REDACTED]		
COMPANY NAME: [REDACTED]		
MAILING ADDRESS: [REDACTED]		
TOWN/CITY: [REDACTED]	STATE: [REDACTED]	ZIP CODE: [REDACTED]
EMAIL ADDRESS: [REDACTED]		
FAX: [REDACTED]	PHONE: [REDACTED]	
ELECTRONIC COMMUNICATION: By initialing here [REDACTED], I hereby authorize NHDES to communicate all matters relative to this application electronically.		
SECTION 6 - PROPERTY OWNER INFORMATION (IF DIFFERENT THAN APPLICANT) (Env-Wt 311.04(b))		
If the owner is a trust or a company, then complete with the trust or company information.		
<input checked="" type="checkbox"/> Same as applicant		
NAME: [REDACTED]		
MAILING ADDRESS: [REDACTED]		
TOWN/CITY: [REDACTED]	STATE: [REDACTED]	ZIP CODE: [REDACTED]
EMAIL ADDRESS: Andrew.OSullivan@dot.nh.gov		
FAX: [REDACTED]	PHONE: 603-271-3226	
ELECTRONIC COMMUNICATION: By initialing here AMO, I hereby authorize NHDES to communicate all matters relative to this application electronically.		

SECTION 7 - RESOURCE-SPECIFIC CRITERIA ESTABLISHED IN Env-Wt 400, Env-Wt 500, Env-Wt 600, Env-Wt 700, OR Env-Wt 900 HAVE BEEN MET (Env-Wt 313.01(a)(3))

Describe how the resource-specific criteria have been met for each chapter listed above (please attach information about stream crossings, coastal resources, prime wetlands, or non-tidal wetlands and surface waters):

In accordance with Env-Wt 400 the jurisdictional areas within the project limits have been delineated by Sarah Large and Deidra Benjamin, of NHDOT, on 5/27/21. The jurisdictional areas are referenced on the attached included wetland impact plans. The project has been designed in accordance with Env-Wt 527, and Env-Wt 900 to the maximum extent practicable. The application includes a technical report as well as details within the supplemental narrative to address Env-Wt 904.10- Alternative Designs. Unavoidable temporary impacts to wetlands have been minimized to the maximum extent practicable. No permanent impacts are proposed. Project specific information is contained within this permit application.

SECTION 8 - AVOIDANCE AND MINIMIZATION

Impacts within wetland jurisdiction must be avoided to the maximum extent practicable (Env-Wt 313.03(a)).* Any project with unavoidable jurisdictional impacts must then be minimized as described in the [Wetlands Best Management Practice Techniques For Avoidance and Minimization](#) and the [Wetlands Permitting: Avoidance, Minimization and Mitigation Fact Sheet](#). For minor or major projects, a functional assessment of all wetlands on the project site is required (Env-Wt 311.03(b)(10)).*

Please refer to the application checklist to ensure you have attached all documents related to avoidance and minimization, as well as functional assessment (where applicable). Use the [Avoidance and Minimization Checklist](#), the [Avoidance and Minimization Narrative](#), or your own avoidance and minimization narrative.

*See Env-Wt 311.03(b)(6) and Env-Wt 311.03(b)(10) for shoreline structure exemptions.

SECTION 9 - MITIGATION REQUIREMENT (Env-Wt 311.02)

If unavoidable jurisdictional impacts require mitigation, a mitigation [pre-application meeting](#) must occur at least 30 days but not more than 90 days prior to submitting this Standard Dredge and Fill Permit Application.

Mitigation Pre-Application Meeting Date: Month: 9 Day: 15 Year: 2021

N/A - Mitigation is not required

SECTION 10 - THE PROJECT MEETS COMPENSATORY MITIGATION REQUIREMENTS (Env-Wt 313.01(a)(1)c)

Confirm that you have submitted a compensatory mitigation proposal that meets the requirements of Env-Wt 800 for all permanent unavoidable impacts that will remain after avoidance and minimization techniques have been exercised to the maximum extent practicable: I confirm submittal.

N/A – Compensatory mitigation is not required

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SECTION 11 - IMPACT AREA (Env-Wt 311.04(g))

For each jurisdictional area that will be/has been impacted, provide square feet (SF) and, if applicable, linear feet (LF) of impact, and note whether the impact is after-the-fact (ATF; i.e., work was started or completed without a permit).

For intermittent and ephemeral streams, the linear footage of impact is measured along the thread of the channel. *Please note, installation of a stream crossing in an ephemeral stream may be undertaken without a permit per Rule Env-Wt 309.02(d), however other dredge or fill impacts should be included below.*

For perennial streams/ivers, the linear footage of impact is calculated by summing the lengths of disturbances to the channel and banks.

Permanent impacts are impacts that will remain after the project is complete (e.g., changes in grade or surface materials).

Temporary impacts are impacts not intended to remain (and will be restored to pre-construction conditions) after the project is completed.

JURISDICTIONAL AREA		PERMANENT			TEMPORARY		
		SF	LF	ATF	SF	LF	ATF
Wetlands	Forested Wetland			<input type="checkbox"/>	644		<input type="checkbox"/>
	Scrub-shrub Wetland			<input type="checkbox"/>			<input type="checkbox"/>
	Emergent Wetland			<input type="checkbox"/>			<input type="checkbox"/>
	Wet Meadow			<input type="checkbox"/>			<input type="checkbox"/>
	Vernal Pool			<input type="checkbox"/>			<input type="checkbox"/>
	Designated Prime Wetland			<input type="checkbox"/>			<input type="checkbox"/>
	Duly-established 100-foot Prime Wetland Buffer			<input type="checkbox"/>			<input type="checkbox"/>
Surface Water	Intermittent / Ephemeral Stream			<input type="checkbox"/>			<input type="checkbox"/>
	Perennial Stream or River			<input type="checkbox"/>	416	83	<input type="checkbox"/>
	Lake / Pond			<input type="checkbox"/>			<input type="checkbox"/>
	Docking - Lake / Pond			<input type="checkbox"/>			<input type="checkbox"/>
	Docking - River			<input type="checkbox"/>			<input type="checkbox"/>
Banks	Bank - Intermittent Stream			<input type="checkbox"/>			<input type="checkbox"/>
	Bank - Perennial Stream / River			<input type="checkbox"/>	376	106	<input type="checkbox"/>
	Bank / Shoreline - Lake / Pond			<input type="checkbox"/>			<input type="checkbox"/>
Tidal	Tidal Waters			<input type="checkbox"/>			<input type="checkbox"/>
	Tidal Marsh			<input type="checkbox"/>			<input type="checkbox"/>
	Sand Dune			<input type="checkbox"/>			<input type="checkbox"/>
	Undeveloped Tidal Buffer Zone (TBZ)			<input type="checkbox"/>			<input type="checkbox"/>
	Previously-developed TBZ			<input type="checkbox"/>			<input type="checkbox"/>
	Docking - Tidal Water			<input type="checkbox"/>			<input type="checkbox"/>
TOTAL					1436	189	

SECTION 12 - APPLICATION FEE (RSA 482-A:3, I)

MINIMUM IMPACT FEE: Flat fee of \$400.

NON-ENFORCEMENT RELATED, PUBLICLY-FUNDED AND SUPERVISED RESTORATION PROJECTS, REGARDLESS OF IMPACT CLASSIFICATION: Flat fee of \$400 (refer to RSA 482-A:3, 1(c) for restrictions).

MINOR OR MAJOR IMPACT FEE: Calculate using the table below:

Permanent and temporary (non-docking): 1436 SF × \$0.40 = \$ 574.4

Seasonal docking structure: SF × \$2.00 = \$

Permanent docking structure: SF × \$4.00 = \$

Projects proposing shoreline structures (including docks) add \$400 = \$

Total = \$

The application fee for minor or major impact is the above calculated total or \$400, whichever is greater = \$ 574.4

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SECTION 13 - PROJECT CLASSIFICATION (Env-Wt 306.05)

Indicate the project classification.

<input type="checkbox"/> Minimum Impact Project	<input type="checkbox"/> Minor Project	<input checked="" type="checkbox"/> Major Project
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SECTION 14 - REQUIRED CERTIFICATIONS (Env-Wt 311.11)

Initial each box below to certify:

Initials: KOM _____ _____	To the best of the signer's knowledge and belief, all required notifications have been provided.
Initials: KOM _____ _____	The information submitted on or with the application is true, complete, and not misleading to the best of the signer's knowledge and belief.
Initials: KOM _____ _____	The signer understands that: <ul style="list-style-type: none"> The submission of false, incomplete, or misleading information constitutes grounds for NHDES to: <ol style="list-style-type: none"> Deny the application. Revoke any approval that is granted based on the information. If the signer is a certified wetland scientist, licensed surveyor, or professional engineer licensed to practice in New Hampshire, refer the matter to the joint board of licensure and certification established by RSA 310-A:1. The signer is subject to the penalties specified in New Hampshire law for falsification in official matters, currently RSA 641. The signature shall constitute authorization for the municipal conservation commission and the Department to inspect the site of the proposed project, except for minimum impact forestry SPN projects and minimum impact trail projects, where the signature shall authorize only the Department to inspect the site pursuant to RSA 482-A:6, II.
Initials: KOM _____ _____	If the applicant is not the owner of the property, each property owner signature shall constitute certification by the signer that he or she is aware of the application being filed and does not object to the filing.

SECTION 15 - REQUIRED SIGNATURES (Env-Wt 311.04(d); Env-Wt 311.11)

SIGNATURE (OWNER): 	PRINT NAME LEGIBLY: NHDOT/Kirk Mudgett	DATE: 11/19/21
SIGNATURE (APPLICANT, IF DIFFERENT FROM OWNER): _____	PRINT NAME LEGIBLY: _____	DATE: _____
SIGNATURE (AGENT, IF APPLICABLE): _____	PRINT NAME LEGIBLY: _____	DATE: _____

SECTION 16 - TOWN / CITY CLERK SIGNATURE (Env-Wt 311.04(f))

As required by RSA 482-A:3, I(a)(1), I hereby certify that the applicant has filed four application forms, four detailed plans, and four USGS location maps with the town/city indicated below.

TOWN/CITY CLERK SIGNATURE: _____	PRINT NAME LEGIBLY: State agency exempt per RSA 482-A:3, I(a)
TOWN/CITY: 4 copies via cert. mail	DATE: exempt per Env-Wt 311.05(a)(14)

DIRECTIONS FOR TOWN/CITY CLERK:

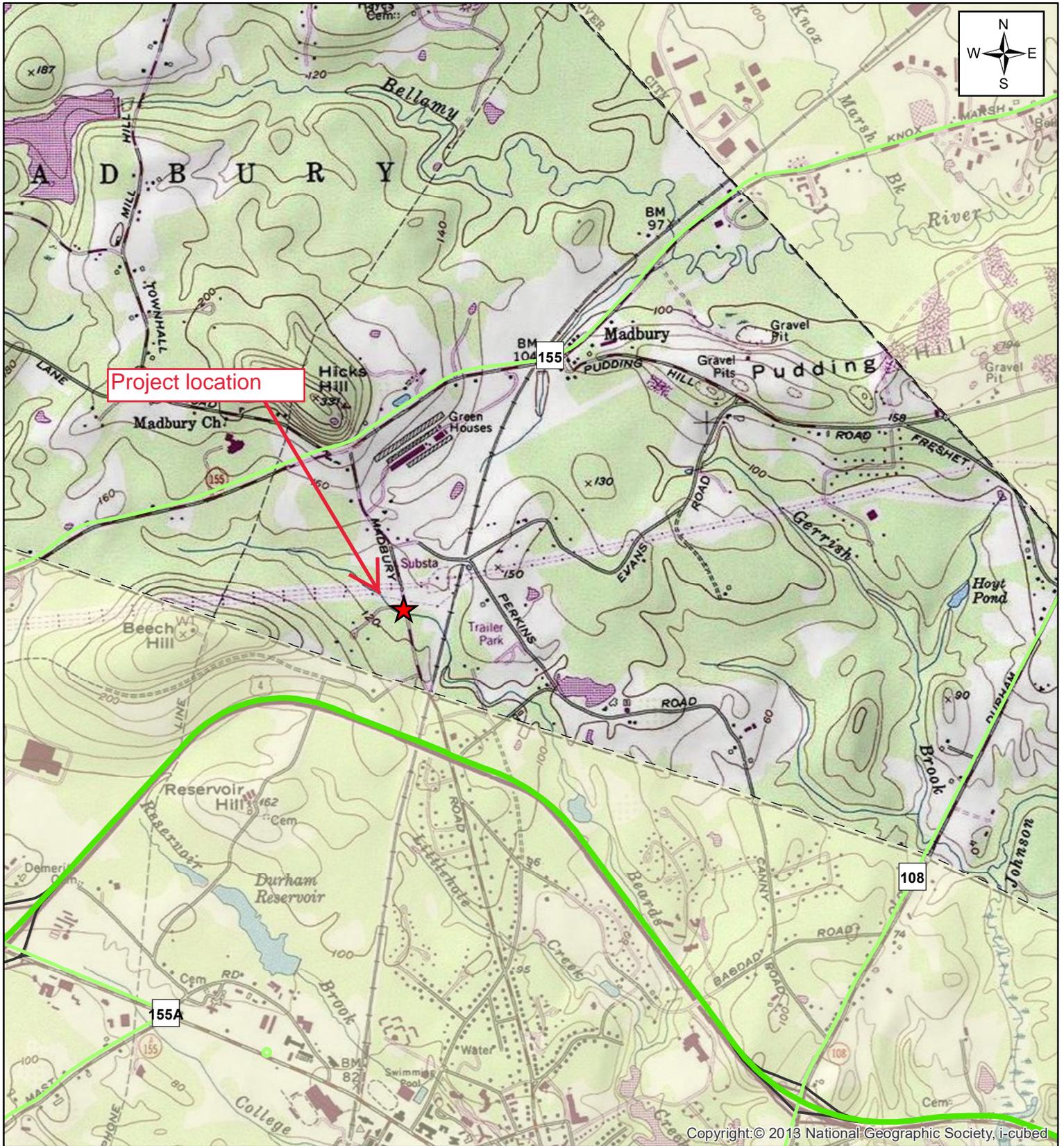
Per RSA 482-A:3, I(a)(1)

1. IMMEDIATELY sign the original application form and four copies in the signature space provided above.
2. Return the signed original application form and attachments to the applicant so that the applicant may submit the application form and attachments to NHDES by mail or hand delivery.
3. IMMEDIATELY distribute a copy of the application with one complete set of attachments to each of the following bodies: the municipal Conservation Commission, the local governing body (Board of Selectmen or Town/City Council), and the Planning Board.
4. Retain one copy of the application form and one complete set of attachments and make them reasonably accessible for public review.

DIRECTIONS FOR APPLICANT:

Submit the original permit application form bearing the signature of the Town/City Clerk, additional materials, and the application fee to NHDES by mail or hand delivery at the address at the bottom of this page. Make check or money order payable to "Treasurer – State of NH".

Madbury, 43276



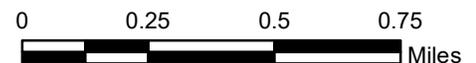
Copyright: © 2013 National Geographic Society, i-cubed

Legend

-  Project Location
-  US Routes
-  State Routes

Map depicting Madbury Road over Beards Creek

Source: S:\Environment\PROJECTS\Madbury 43276



1:24,000

New Hampshire
DOT
Department of Transportation

Madbury, 43276



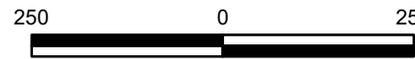
Legend

-  Project Location
-  Parcel Polygons
-  Attributes for Additional Lines

Map depicting Madbury Road over Beards Creek

Source: S:\Environment\PROJECTS\Madbury 43276

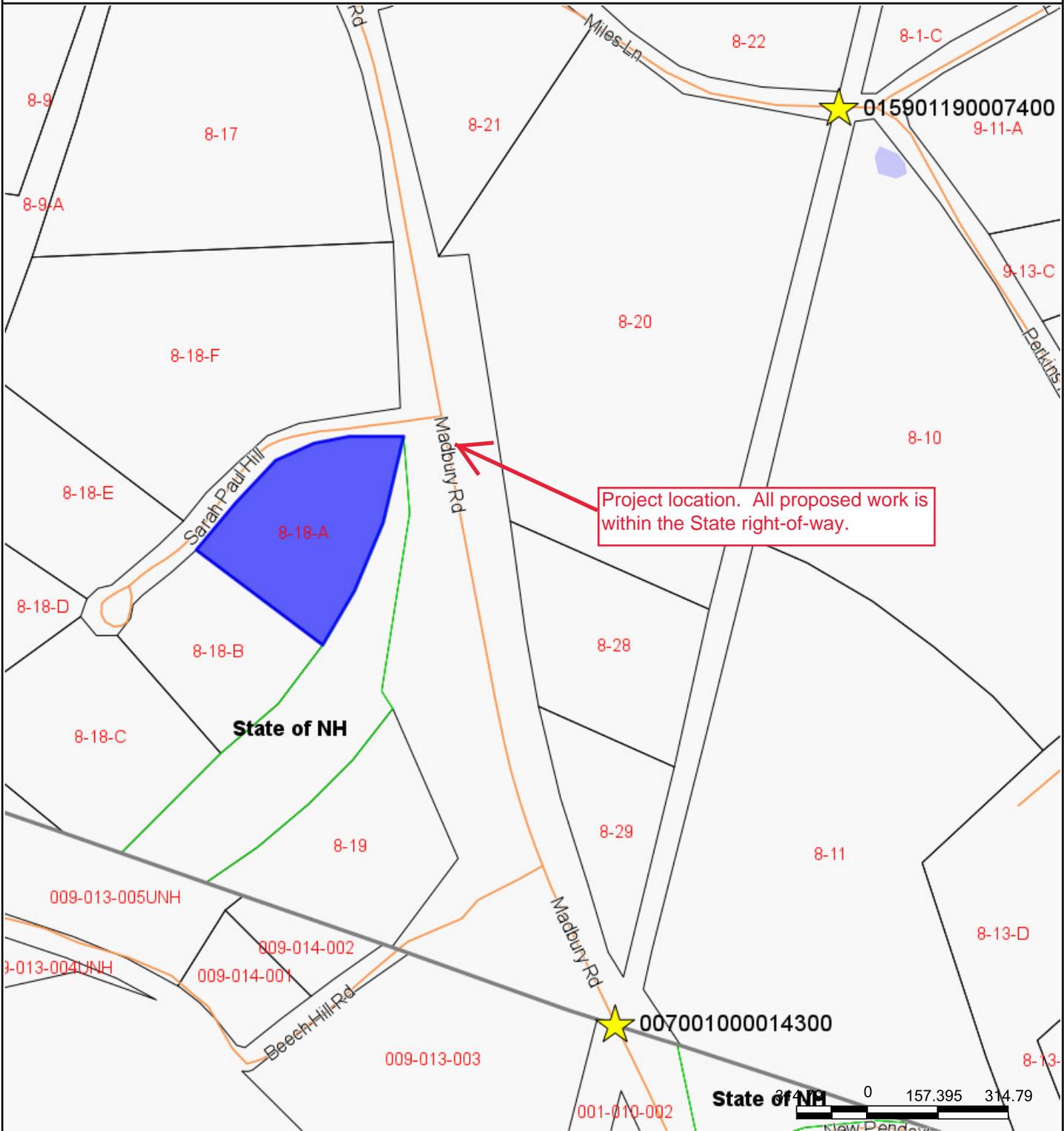
*All proposed work is within the State right-of-way.



1:3,000



Madbury 43276 Mosaic Tax Map



This map was compiled using data believed to be accurate; however, a degree of error is inherent in all maps. This map was distributed "AS-IS" without warranties of any kind, either expressed or implied, including but not limited to warranties of suitability to a particular purpose or use. No attempt has been made in either the design or production of the maps to define the limits or jurisdiction of any federal, state, or local government. Detailed on-the-ground surveys and historical analyses of sites may differ from the maps.



**STANDARD DREDGE AND FILL
WETLANDS PERMIT APPLICATION
ATTACHMENT A: MINOR AND MAJOR PROJECTS**



Water Division/Land Resources Management
Wetlands Bureau

[Check the Status of your Application](#)

RSA/ Rule: RSA 482-A/ Env-Wt 311.10; Env-Wt 313.01(a)(1); Env-Wt 313.03

APPLICANT'S NAME: NH Dept. of Transportation **TOWN NAME:** Madbury

Attachment A is required for *all minor and major projects*, and must be completed *in addition* to the [Avoidance and Minimization Narrative](#) or [Checklist](#) that is required by Env-Wt 307.11.

For projects involving construction or modification of non-tidal shoreline structures over areas of surface waters having an absence of wetland vegetation, only Sections I.X through I.XV are required to be completed.

PART I: AVOIDANCE AND MINIMIZATION

In accordance with Env-Wt 313.03(a), the Department shall not approve any alteration of any jurisdictional area unless the applicant demonstrates that the potential impacts to jurisdictional areas have been avoided to the maximum extent practicable and that any unavoidable impacts have been minimized, as described in the [Wetlands Best Management Practice Techniques For Avoidance and Minimization](#).

SECTION I.I - ALTERNATIVES (Env-Wt 313.03(b)(1))

Describe how there is no practicable alternative that would have a less adverse impact on the area and environments under the Department's jurisdiction.

A FULLY COMPLIANT STREAM CROSSING DESIGN WOULD INVOLVE REPLACING THE EXISTING 58" WIDE X 36" HIGH CMP ARCH CULVERT WITH AN 8' SPAN X 4' HIGH (CLEAR OPENING) EMBEDDED BOX CULVERT WITH A WILDLIFE SHELF INSIDE. THE CURRENT CONSTRUCTION COST ESTIMATE FOR THIS OPTION IS \$1,201,898. SECURING FUNDING AND ADDITIONAL DESIGN TIME FOR THIS OPTION WOULD REQUIRE A DELAY IN THE START OF CONSTRUCTION OF 3 – 5 YEARS. A DELAY OF THIS MAGNITUDE WOULD SIGNIFICANTLY INCREASE THE RISK OF DEFORMATION OR FAILURE OF THE EXISTING PIPE AND POTENTIAL SINKHOLES DEVELOPING IN THE DEEP EMBANKMENT FILL.

A HYDRAULIC DESIGN WAS ALSO CONSIDERED, THAT WOULD PASS THE 50 YEAR STORM WITHOUT SUBMERGING THE INLET. THIS WOULD BE A 6' SPAN X 4' HIGH (CLEAR OPENING EMBEDDED BOX CULVERT. THE CURRENT CONSTRUCTION COST ESTIMATE FOR THIS OPTION IS \$1,111,262. THE EXTENT OF THE IMPACTS AND DELAY IN CONSTRUCTION WOULD BE SIMILAR TO THE COMPLIANT SPAN OPTION.

NONE OF THE REPLACEMENT ALTERNATIVES MEETS THE PROJECT OBJECTIVE OF A TIMELY STRUCTURAL REPAIR WHILE BALANCING EFFECTS ON CAPACITY, VELOCITY, AND OTHER RESOURCES.

PERMANENT IMPACTS WERE AVOIDED. ALL OF THE IMPACTS ASSOCIATED WITH PROPOSED DESIGN ARE TEMPORARY.

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SECTION I.II - MARSHES (Env-Wt 313.03(b)(2))

Describe how the project avoids and minimizes impacts to tidal marshes and non-tidal marshes where documented to provide sources of nutrients for finfish, crustacean, shellfish, and wildlife of significant value.

There are no palustrine marshes delineated within the project area.

SECTION I.III - HYDROLOGIC CONNECTION (Env-Wt 313.03(b)(3))

Describe how the project maintains hydrologic connections between adjacent wetland or stream systems.

The existing culvert provides a hydrologic connection between the upstream and downstream channels of Beards Creek. There is no existing perch at the inlet or outlet. The invert of the proposed liner pipe will be set as close as practical to the existing culvert invert (estimated 2" raise in inverts). Temporary disturbance to inlet and outlet areas will be restored such that there is no perch. The proposed liner will maintain the existing hydrologic connection and match the existing flow conditions to the maximum extent practicable. There will be no permanent impact on wetlands adjacent to the upstream and downstream channels. The hydrologic connection between the forested wetlands upstream and the scrub-shrub wetlands downstream will remain the same post construction.

SECTION I.IV - JURISDICTIONAL IMPACTS (Env-Wt 313.03(b)(4))

Describe how the project avoids and minimizes impacts to wetlands and other areas of jurisdiction under RSA 482-A, especially those in which there are exemplary natural communities, vernal pools, protected species and habitat, documented fisheries, and habitat and reproduction areas for species of concern, or any combination thereof.

The project has been designed in accordance with Env-Wt 400, 500, and 900. Unavoidable impacts to wetlands have been minimized to the maximum extent practicable; the Department has addressed Env-Wt 311.07 Avoidance and Minimization through the checklist document included with this application.

The resources present within the project area are: Beards Creek (a perennial stream), palustrine scrub-shrub wetlands downstream of the culvert outlet, and forested palustrine wetlands upstream of the culvert inlet and along the toe of the Madbury Road embankment.

There are no vernal pools or exemplary natural communities known to occur in the project area. The NH Natural Heritage Bureau (NHNHB) reviewed the project area for records of protected species and exemplary natural communities near the project area. The review found records of Blanding's turtle (state endangered), northern black racer (state threatened), and spotted turtle (state threatened) in their database. Exemplary natural communities were not identified in the NHNHB review.

The project area is within the range of the northern long eared bat (NLEB) which is listed as a threatened species under the Federal Endangered Species Act. The US Fish and Wildlife Service (USFWS) Information for Planning and Conservation webtool was used to determine that the project qualifies for the December 15, 2016 FHWA Range-wide Programmatic Biological Opinion for NLEB and the USFWS has concurred that the project has a May Affect, Likely to Adversely Affect determination due to the need to clear trees during the NLEB active season. All appropriate Avoidance and Minimization Measures will be included in the contract document and no further consultation is necessary.

SECTION I.V - PUBLIC COMMERCE, NAVIGATION, OR RECREATION (Env-Wt 313.03(b)(5))

Describe how the project avoids and minimizes impacts that eliminate, depreciate or obstruct public commerce, navigation, or recreation.

The proposed design/work will allow traffic to continue to flow along Madbury Road during construction minimizing the impact to local and regional commuting and commerce. In the project area, Beards Creek is not used for water recreation nor is it an identified fishing location. The site is not a suitable nor feasible recreation area and therefore the level of impact to recreation will be minimal to none.

SECTION I.VI - FLOODPLAIN WETLANDS (Env-Wt 313.03(b)(6))

Describe how the project avoids and minimizes impacts to floodplain wetlands that provide flood storage.

In the project area, Beards Creek is not within a mapped 100-year floodplain. The wetlands adjacent to Beards Creek do provide a flood storage function. The proposed rehabilitation method selected most closely matches existing conditions and will not have a significant effect on flood storage, flood elevations, or the adjacent wetlands' flood storage function.

Impacts within the stream channel and banks are temporary and are associated with accessing the inlet and outlet of the crossing to construct the headwall and install the liner. Impacts to the forested wetlands in the vicinity of the culvert inlet are associated with water diversion and erosion controls and are temporary. All temporary impacts will be restored to their original condition post construction per Env-Wt 307.12.

SECTION I.VII - RIVERINE FORESTED WETLAND SYSTEMS AND SCRUB-SHRUB – MARSH COMPLEXES (Env-Wt 313.03(b)(7))

Describe how the project avoids and minimizes impacts to natural riverine forested wetland systems and scrub-shrub – marsh complexes of high ecological integrity.

Avoidance of all impacts is not practicable due to the poor structural condition of the existing culvert. The proposed design has the least impact to wetlands of any practicable alternative.

The impacts to the riverine wetlands in the project area are temporary and will not have a permanent effect on the functions and values of the wetlands.

The impacts to the palustrine forested wetlands upstream are temporary and will not have a permanent effect on the functions and values of the wetlands.

There are no proposed impacts to the palustrine scrub-shrub wetlands downstream of the culvert outlet.

SECTION I.VIII - DRINKING WATER SUPPLY AND GROUNDWATER AQUIFER LEVELS (Env-Wt 313.03(b)(8))

Describe how the project avoids and minimizes impacts to wetlands that would be detrimental to adjacent drinking water supply and groundwater aquifer levels.

The project will have no effect on wetlands that would be detrimental to adjacent drinking water supply and groundwater aquifer levels.

SECTION I.IX - STREAM CHANNELS (Env-Wt 313.03(b)(9))

Describe how the project avoids and minimizes adverse impacts to stream channels and the ability of such channels to handle runoff of waters.

The project includes only temporary impacts to the upstream and downstream channels. The smaller diameter liner will not have a significant impact on the outlet velocity or surface water elevations. The stream channel will continue to capture, contain, and convey stormwater runoff in the same manner as it does today. The surrounding landscape topography will not be changed as a result of this project, therefore stormwater runoff will enter the stream system the same way it currently does.

SECTION I.X - SHORELINE STRUCTURES - CONSTRUCTION SURFACE AREA (Env-Wt 313.03(c)(1))

Describe how the project has been designed to use the minimum construction surface area over surface waters necessary to meet the stated purpose of the structures.

N/A - The project does not involve shoreline structures.

SECTION I.XI - SHORELINE STRUCTURES - LEAST INTRUSIVE UPON PUBLIC TRUST (Env-Wt 313.03(c)(2))

Describe how the type of construction proposed is the least intrusive upon the public trust that will ensure safe docking on the frontage.

N/A

SECTION I.XII - SHORELINE STRUCTURES – ABUTTING PROPERTIES (Env-Wt 313.03(c)(3))

Describe how the structures have been designed to avoid and minimize impacts on ability of abutting owners to use and enjoy their properties.

N/A

SECTION I.XIII - SHORELINE STRUCTURES – COMMERCE AND RECREATION (Env-Wt 313.03(c)(4))

Describe how the structures have been designed to avoid and minimize impacts to the public's right to navigation, passage, and use of the resource for commerce and recreation.

N/A

SECTION I.XIV - SHORELINE STRUCTURES – WATER QUALITY, AQUATIC VEGETATION, WILDLIFE AND FINFISH HABITAT (Env-Wt 313.03(c)(5))

Describe how the structures have been designed, located, and configured to avoid impacts to water quality, aquatic vegetation, and wildlife and finfish habitat.

N/A

SECTION I.XV - SHORELINE STRUCTURES – VEGETATION REMOVAL, ACCESS POINTS, AND SHORELINE STABILITY (Env-Wt 313.03(c)(6))

Describe how the structures have been designed to avoid and minimize the removal of vegetation, the number of access points through wetlands or over the bank, and activities that may have an adverse effect on shoreline stability.

N/A

PART II: FUNCTIONAL ASSESSMENT	
REQUIREMENTS	Ensure that project meets the requirements of Env-Wt 311.10 regarding functional assessment (Env-Wt 311.04(j); Env-Wt 311.10).
FUNCTIONAL ASSESSMENT METHOD USED:	A stream assessment was conducted using the Army Corps Highway Methodology.
NAME OF CERTIFIED WETLAND SCIENTIST (FOR NON-TIDAL PROJECTS) OR QUALIFIED COASTAL PROFESSIONAL (FOR TIDAL PROJECTS) WHO COMPLETED THE ASSESSMENT:	SARAH LARGE AND DEIDRA BENJAMIN
DELINEATION PER ENV-WT406	
DATE OF ASSESSMENT:	5/27/21
Check this box to confirm that the application includes a NARRATIVE ON FUNCTIONAL ASSESSMENT:	<input type="checkbox"/>
For minor or major projects requiring a standard permit without mitigation, the applicant shall submit a wetland evaluation report that includes completed checklists and information demonstrating the RELATIVE FUNCTIONS AND VALUES OF EACH WETLAND EVALUATED. Check this box to confirm that the application includes this information, if applicable:	<input type="checkbox"/>
Note: The Wetlands Functional Assessment worksheet can be used to compile the information needed to meet functional assessment requirements.	

**CULVERT REHABILITATION
MADBURY ROAD OVER BEARDS CREEK
MADBURY, NH
NHDOT PROJECT NO. 43276
SUPPLEMENTAL NARRATIVE**

Project Description

The project will rehabilitate an existing 58” wide x 36” high x 131’ long corrugated metal arch culvert carrying Beards Creek under Madbury Road located approximately one half mile north of US 4. The proposed rehabilitation will remove approximately 7’ of the existing culvert at the inlet, construct a concrete headwall, and slipline the remaining portion of the existing pipe with a polymer coated corrugated metal arch pipe liner. Incidental work is limited to matching the existing stream channel to the new headwall at the inlet.

This is a federally funded culvert rehabilitation project. The proposed Advertising Date is March 29, 2022, with construction anticipated in the summer of 2022.

This project was initiated and is funded under NHDOT’s Federal Culvert Replacement/Rehabilitation & Drainage Repair (CRDR) Program. The Program purpose is to address major culvert and drainage needs statewide that are not being addressed through current or future Capital Improvement or other programmatic projects. The Program receives \$2,000,000 in total funding annually, which includes construction, engineering, and ROW costs. Projects are selected and scheduled based primarily on the condition of the culvert (risk of failure), Road Tier, traffic volume, depth of fill, and detour length (potential impact of failure). The Program funding is fully committed for at least the next three years. This culvert is one of the highest statewide priority locations out of nearly 50 known locations eligible for the Program. Failure to address the structural deficiency of this culvert risks deformation of the culvert which would make rehabilitation impossible and/or lead to collapse of the culvert which could cause serious impacts to public/private infrastructure and the travelling public.

Existing Conditions

The existing crossing is a 58” wide x 36” high x 131’ long corrugated metal arch pipe originally constructed in 1980. Slope is about 0.8% and the ends are square cut with no headwalls. Embankment fill height is about 16’. Note that the original construction plan indicated a length of 131.9’, which was rounded to 132’ for initial coordination. The 131’ length referenced in the Plans and elsewhere in the application is based on current NHDOT survey.

The crossing is a Tier 2 based on drainage area. Streamstats reports drainage area at 0.42 sq mi (268.5 acres). Review of LIDAR contours found additional contributing area in the upper watershed, making the total area 376 acres, or about 0.588 Sq miles. The DES permit planning tool returned an area of 0.562 sq mi. (360 ac). The LIDAR boundary was used for analysis.

Madbury Road is classified as a Tier 4 roadway (Local Connector), with average daily traffic volume in 2019 of 5,177 vehicles per day. Madbury Road provides access to and from residential development to US 4 and NH Route 155 and allows commercial traffic to efficiently serve residential customers.

The culvert is in poor condition with heavy rust, some perforations, and a dent in the lower side of the inlet edge. Sections of missing invert near the inlet have caused small sinkholes and loss of backfill around the culvert.

Madbury Rd has mild embankment slopes (4:1) with good grass cover up to the ROW line (total ROW width is about 200'). The culvert inlet channel is about 6' wide x 12" deep at about 0.2% average slope, and is bordered by woods on one side and the roadway embankment on the other. The stream bed elevation is a few inches lower than the culvert invert in places immediately upstream. There are rounded stones around the culvert inlet which appear to have been placed intentionally. There are cobbles and boulders in other places around the inlet and along the inlet channel that appear natural.

The culvert outlet channel is straight up to the ROW, as shown on the 1980 archive plan. The channel then enters a wet area where the channel begins to meander naturally. See Exhibit 1 Archive Plan, State Project #S3091, Sheet 25, attached elsewhere in this application. Note that Beards Creek is not shown or labelled on the archive plan and that there was a gravel driveway constructed in the vicinity of where Sarah Paul Hill Road is currently located.

NHDOT District 5 Maintenance reports no history of flooding related to the culvert.

Multiple field reviews by NHDOT found no perch at the inlet or outlet of the culvert.

There is a Town road crossing (Sarah Paul Hill Rd) about 175 ft. upstream of the State culvert inlet. The Town road crossing consists of three 24" pipes, one old corrugated aluminum pipe and two recently installed plastic pipes. Discussion with the Town Road Agent indicated no recent history of flooding of the Town Road, except for one time when the State culvert was blocked by beavers. There was no indication that the Town has any plans to replace or upsize the crossing.

Upstream of the Town crossing is a large wet area which provides significant storage (about 9.9 ac-ft at elevation equal to the Town road low point, EL 110.44).

A stream assessment was completed by NHDOT on 5/27/2021. See the Stream Crossing Worksheet elsewhere in this application.

Natural and Cultural Resources

Threatened and Endangered Species:

Federal or State listed endangered or threatened species in the project area: the Northern Long Eared Bat. USFWS has verified that this project may rely on the revised February 5, 2018, FHWA, FRA, FTA Programmatic Biological Opinion for Transportation Projects within the Range of the Indiana Bat and Northern Long-eared Bat. The project has a may affect - likely to adversely affect determination for NLEB due to tree clearing and no further consultation is needed. No time of year restrictions on clearing are proposed.

The Natural Heritage Bureau data check:

The Natural Heritage Bureau data check identified records of Blanding's turtle, spotted turtle, and northern black racer. Kim Tuttle of NHFG determined the extremely long length and subsequent darkness of this culvert may present a psychological barrier for turtles to enter the culvert, the project should avoid the use of plastic in erosion control matting, wildlife friendly erosion control options should be utilized, the turtle poster shall be shared with all personnel construction personnel, and information directing personnel to contract NHFG if Blanding's or spotted turtles are found laying eggs or if the northern black racer is observed.

Essential Fish Habitat:

Beards Creek is considered Essential Fish Habitat for winter flounder (specifically the juvenile life stage). Information for the preferred alternative was sent to NOAA on September 20, 2021. No conservation measures were recommended. NHFG marine biologists were contacted to determine if this area is supportive of diadromous resources and it was determined that American eel is likely present at this location, however, NOAA does not provide time of year restrictions for eel only.

NH Fish & Game Coordination:

NHFG was contacted in the early design phase and they determined they do not have any fish data for this stream but fish do use corrugations to move upstream through culverts.

Cultural Resources: The proposed work was reviewed by the Department's Cultural Resources Program and was found to be consistent with the Section 106 Programmatic Agreement (Section 106 PA) among the FHWA, the New Hampshire State Historic Preservation Office, the Advisory Council on Historic Preservation and the Department. The existing culvert is eligible for review under the Program Comment for Post-1945 Bridges and Culverts and is therefore considered to be non-historic. As such, the proposed work has been determined to have no potential to cause effects to historical resources under Appendix B of the Section 106 PA.

Wetlands:

In addition to Beards Creek, other wetland resources present within the project area include palustrine forested wetlands adjacent to the stream near the culvert inlet and palustrine scrub-shrub wetlands adjacent to the stream near the culvert outlet. All impacts to wetlands are temporary and have been minimized.

Water Quality:

The level of disturbance meets the Bureau of Alteration of terrain (AOT) threshold of greater than 2,500 SF disturbance within 50' of a surface water, however, the project is consistent with the AOT Permit-by-Rule. The project does not propose to increase the amount of impervious surface. It is anticipated that the project will not result in a negative impact on water quality in the project area and therefore, no permanent stormwater treatment is proposed. A NPDES Discharge General Permit may be required if dewatering within the stream is required. Best Management practices will be utilized to prevent and reduce the likelihood of erosion or sediment entering the wetlands system. See the included erosion control plans for more details regarding BMPs.

Prime Wetlands, Designated Rivers, and Shoreland Water Quality Protection Act:

There are no prime wetlands in the vicinity of the project area and the project is not located within the protected corridor of any designated rivers. The project is not located near any waterbodies protected by the NH Shoreland Water Quality Protection Act.

Floodplains:

Beards Creek is not within a FEMA mapped floodplain in the project area.

Invasive Species: Populations of Type I and Type II invasive species are present within the project area. Glossy buckthorn and multiflora rose (Type I species) and purple loosestrife (Type II) species were identified in a field review on May 27, 2021. The Contractor will be required to perform all work activities in accordance with the Department publication "Best Management Practices for the Control of Invasive and Noxious Plant Species" in order to prevent the spread of invasive species to the site during construction.

Contamination:

No point source or PFAS concerns were identified with the proposed project.

Limited Reuse Soils (LRS) excavated from within the operational State right-of-way shall be addressed in accordance with applicable NHDES rules, waivers, and/or Soils Management Plans.

Wildlife Action Plan:

Supporting landscape exists in the areas at the culvert inlet and outlet. The project area is identified as a wildlife corridor on Nature Conservancy's Connect the Coast map. At the September 15, 2021 Natural Resource Agency Meeting, Pete Steckler of the Nature Conservancy asked if the project could be postponed and could the 4' x 8' structure be considered if funding was not an issue in order to see how the new federal funding plays out. It was discussed that the culvert is in poor condition and needs to be fixed as soon as possible to prevent failure.

Conservation Lands: No conservation lands were identified in the project impact area.

NHDES Aquatic Restoration Mapper:

There were two records for the Madbury Road culvert with some inaccurate and conflicting information. The Madbury Rd. crossing was scored "partial" for Geomorphic Compatibility, AOP scored "Reduced Passage", and Hydraulic Vulnerability or Overtopping was indicated at 10 year and higher events. There were no Flood Hazard flags. The Sarah Paul Hill Rd crossing did have a Flood Hazard flag as follows: *"Severe storm caused significant flooding along Beards Creek. Residents living on Sarah Paul Hill were impacted. In recent years there were problems on Madbury Rd and Sarah Paul Hill with beavers causing floods.-2006, 2007"*

Conservation Commission: The Town of Madbury Conservation Commission was contacted via letter on September 21, 2021 requesting information about the project area and feedback on the proposed work. To date, no response has been received.

Hydrology / Hydraulics

Note that LIDAR and NHDOT Survey from May 2021 are both referenced to the NAVD88 vertical datum. No elevation adjustments were necessary. As previously noted, watershed area of 376 acres, as determined from LIDAR, was used for analysis.

The low point in Sarah Paul Hill Road is about 140' west of Madbury Rd at EL 110.44. If Sarah Paul Hill Road were to overtop, flow would enter the wetland immediately across the road and continue to the inlet of the State Culvert.

The low point in Madbury Road is about 400' north of the culvert (under the power lines) at EL 112.51. If Madbury Road were to overtop, flow would enter the wetland immediately across the road and return to Beards Creek.

The next downstream structure on Beards Creek is a 6' span x 7' high stone arch culvert under an active railroad. This crossing is about 650 ft downstream of the Madbury Rd culvert outlet.

Streamstats predicts Q100 at 106 cfs using the revised 376 ac boundary. Confidence limits were not reported. The FHWA Regression Equations predict Q100 between 97 and 137 cfs. The SCS Method (Hydrocadd) predicts Q100 at 200 cfs, using the Cornell 24 hr rainfall predictions.

Note that the 100-year flow from the SCS Method is significantly higher than the other methods, primarily due to high 24 hr rainfall predictions from Cornell. The Cornell 100-year 24 hr rainfall prediction is 8.57", with confidence limits from 6.69" to 10.51". Historic rainfall records from the Cornell website indicate no 24 hour events greater than 6.6" from 1948 – 2008 in the vicinity of the project.

Based on the relatively good agreement between Streamstats and FHWA equations, uncertainties in the SCS Method results, and reported past performance of the State and Town culverts, Streamstats runoff predictions would be appropriate for design of a replacement structure and analysis of the effect of rehabilitation options. Note the Streamstats warnings in the report due to the revised boundary and drainage area being below the minimum 0.7 sq mi area. A support request was submitted on 9-27-21 and the Streamstats predictions were verified based on the instructions in the reply. Streamstats report and coordination/verification of flows is attached elsewhere in this application.

Streamstats design flows are as follows:

Q2 = 19.3 cfs Q10 = 48 cfs Q50 = 84.8 cfs Q100 = 106 cfs

Hydraulic modelling for all culverts (and alternatives) was performed using FHWA's HY-8 Culvert analysis Program. Where the Hydrocadd model was used, culvert rating tables from HY-8 were input into the Hydrocadd model. The HY-8 modelling includes tailwater effects for both the State and Town culverts. A limited tailwater effect on the State culvert was found due to the flat slope and heavy vegetation in the outlet area. Eliminating the tailwater effect would only improve capacity by about 1.6% at high flows.

The conservative analysis using the SCS runoff predictions was presented at the Sept. 2021 Natural Resource Meeting finding that the existing Town crossing can pass about 6.05" of rain in a 24 hour period before overtopping. This capacity considers upstream storage and tailwater effects from the existing State culvert. If influence from the State culvert was eliminated, the Town crossing could pass about 6.3" of rain in 24 hrs without overtopping, suggesting that the tailwater effect from the State culvert is not significant, especially at the lower flows estimated by other methods.

Note that existing culverts are modelled assuming they are clean and undamaged with nominal dimensions as they were originally installed. Attempting to model damaged or deformed shapes or blockages is not practical or necessary in most cases. Based on these assumptions, hydraulic capacity of the State culvert would not be the cause of flooding of the Town road crossing. With the available upstream storage included, the State culvert could pass the 100-year flow from any of the cited methods without bypass or overtopping of Madbury Road.

The SCS Method and associated Hydrocadd model were used to evaluate the 100-year, 24 hour storm, with upstream storage included, finding the existing 100-year flood elevation at the State culvert inlet to be EL 111.70.

Alternatives

Alternatives considered included replacement with a compliant span structure, replacement with a hydraulically sized culvert, and several rehabilitation methods.

Replacement with an 8' span x 4' high (clear opening) embedded box culvert, would meet the compliant span requirement. The shortest length that would be proposed is 82' long, to avoid adding new guardrail. Excavation of the roadway would be 20' deep and 20' wide at the culvert and 100' long at the top. A sheet pile cofferdam would be used to support the portion of roadway open to traffic and significant temporary widenings would be required on both sides of the roadway to accommodate the phased construction. The current construction cost estimate for this option is \$1,201,898. Securing funding and additional design time for this option would require a delay in the start of construction of 3 – 5 years. A delay of this magnitude would significantly increase the risk of deformation or failure of the existing pipe and potential sinkholes developing in the deep embankment fill.

Replacement with a hydraulically sized culvert would be a 6' span x 4' high (clear opening) embedded box culvert. This structure is sized to pass Q50 without submerging the inlet. Length would be the same as for the compliant span option. The current construction cost estimate for this option is \$1,111,262. Impacts, delay in construction, and risk would be the same as for the compliant span option.

Rehabilitation alternatives that were considered and/or eliminated:

Shotcrete invert repair was not considered due to the 36" height of the existing culvert.

Smooth plastic pipe liners were not considered because they are not available in arch shapes and use of a circular shape would result in a large reduction in pipe area.

Corrugated Metal pipe liner – This option typically has the least effect on velocity and would maintain the existing (corrugated interior) condition for AOP and fish passage. Arch shape liners are limited to standard sizes, with 49" span x 33" rise being the largest size that would fit through the existing pipe. The smaller size tends to reduce capacity, but in this case replacing the projecting end with a headwall would result in the capacity being approximately equal to existing. The current Construction cost estimate for this option is \$268,056.

Cured in Place (CIPP) liner – This option is the only one that significantly increases capacity. This type of liner conforms to the existing pipe corrugations, but has a lower roughness value which causes an increase in velocity over a range of flows. Construction cost estimate \$303,623.

Glass Reinforced Plastic (GRP) pipe liner – custom shapes are available to minimize reduction in diameter. This product is similar to fiberglass and has a smooth interior. A “no-slip” texture strip can be applied to the bottom of the liner (roughness similar to brushed concrete). Construction cost estimate \$342,113.

The proposed rehabilitation is intended to accomplish a timely structural repair while balancing effects on capacity, velocity, and other resources.

Hydraulic modelling was performed using FHWA’s HY-8 Culvert analysis Program, without consideration of the significant storage upstream of the Town culverts. Comparison of model results is as follows:

	Performance at Madbury Rd Overtopping Elev 112.51		Low Flow Q= 5 cfs	2 Year Flow Q= 19 cfs
	Flow (cfs)	Outlet Vel. (ft/s)	Outlet Vel. (ft/s)	Outlet Vel. (ft/s)
Existing cmp 58" x 36"	102	9.1	1.8	3.1
Polymer Coated CMP Liner 49" x 33"	102	11.1	2.3	3.8
GRP Custom Size Liner 51.9" x 29.5"	107	12.5	3.9	6.4
Cured in Place Liner	123	11.6	3.7	6.0

All liner options assume shortening the pipe to 124 LF and constructing a headwall at the inlet.

The GRP custom size liner is the most expensive and has the highest velocities due to the majority of the liner having a smooth interior. Only the cured in place option has a significant capacity improvement. The corrugated metal liner is the least cost and most closely matches existing conditions.

The Preferred Alternative and Proposed Design is sliplining with the corrugated metal pipe liner.

Proposed Design

The proposed design will remove a portion of the damaged inlet end, shortening the culvert by about 7', and constructing a more hydraulically efficient headwall with wing walls at the inlet. The headwall will closely match the existing embankment slopes such that only minimal re-grading will be required. The area of pipe removed will be replaced with simulated streambed material at 5' wide for the channel bottom and vegetated side slopes at 1.5:1 or flatter slopes. Any sinkholes on the embankment slopes will be filled, seeded and mulched to reestablish the embankment and grass cover.

The remaining 124 LF of culvert will be sliplined with a polymer coated corrugated metal pipe liner. The space between the host pipe and liner will be filled with grout. The liner inverts will be about 2" higher than the existing pipe inverts.

Hydraulic analysis for the proposed 49" x 33" liner with a standard headwall indicates a capacity of 80 cfs at headwater elevation equal to the Town Road low point (EL 110.44). Adding a beveled edge to the inlet headwall will increase the rehabilitated culvert capacity by about 5% to approximately 84 cfs (vs the 50-year design flow of 84.8 cfs). This result meets the NHDOT requirement to pass the 50-year storm. This analysis does not consider the significant amount of storage upstream of the Town stream crossing, which would reduce the actual peak flow that needs to be carried by the State culvert. This scenario would represent the condition created by future upsizing of the Town culvert crossing and loss of all of the upstream storage.

For consistency purposes, the SCS Method and associated Hydrocadd model were used to evaluate the 100-year, 24 hour storm, with upstream storage included, for the rehabilitated crossing finding the 100-year flood elevation at the culvert inlet to be EL 111.62, slightly lower than the existing 100-year elevation of EL 111.70.

A simulated streambed material specification is included elsewhere in the application for filling the area occupied by the portion of pipe to be removed at the inlet. Gradation is based on the visual observations in the NHDOT Stream Assessment and field review of the inlet channel area. Existing rounded stones around the culvert inlet may be randomly embedded in the simulated streambed subgrade. A 6" minimum thickness layer of silty/sandy organic material will be used for the streambed surface layer.

The small amount of accumulated sediment in the culvert outlet and outlet channel makes the existing streambed elevation about 2" higher than the existing culvert's outlet invert. The new liner invert will closely match the existing outlet channel elevation making any significant re-grading unnecessary. No need for permanent impact is anticipated.

Total project duration is expected to be 2 to 3 months, with the majority of the time being for mobilization, erosion controls, water diversion, and restoration.

The proposed rehabilitation will not have a significant effect on capacity or velocity. There will be no significant effect on the frequency of flooding, or sediment transport. There will be no permanent effect to the stream channel or adjacent wetlands.

All work will be within the existing ROW.

The project will be under the 1 acre threshold for earth disturbance for CGP coverage. Total disturbed area is estimated at 19,500 SF (0.44 acres). No disturbance to existing paved areas is anticipated.

No Permanent Impacts are proposed.

Limits of wetland temporary impacts were set at a distance of about 50' left and right of the inlet along the woods line and about 30' downstream of the existing culvert end at the ROW line. These impacts are to allow for erosion controls and water diversion at the inlet and setup and insertion of pipe liner sections from the outlet end. Pipe liners can typically be inserted from either end, but for this site, insertion from the outlet end would be the most practical and least impact option.

Construction and access considerations

Access to the culvert inlet and outlet will be from the edges of Madbury Rd. Slopes are relatively flat (4:1) maintained grass, so no special access concerns are expected. Where necessary and as directed by the NHDOT Engineer, stone over geotextile or other temporary stabilization methods will be used for stabilized construction entrances and to avoid excessive rutting and potential erosion of the roadway embankment.

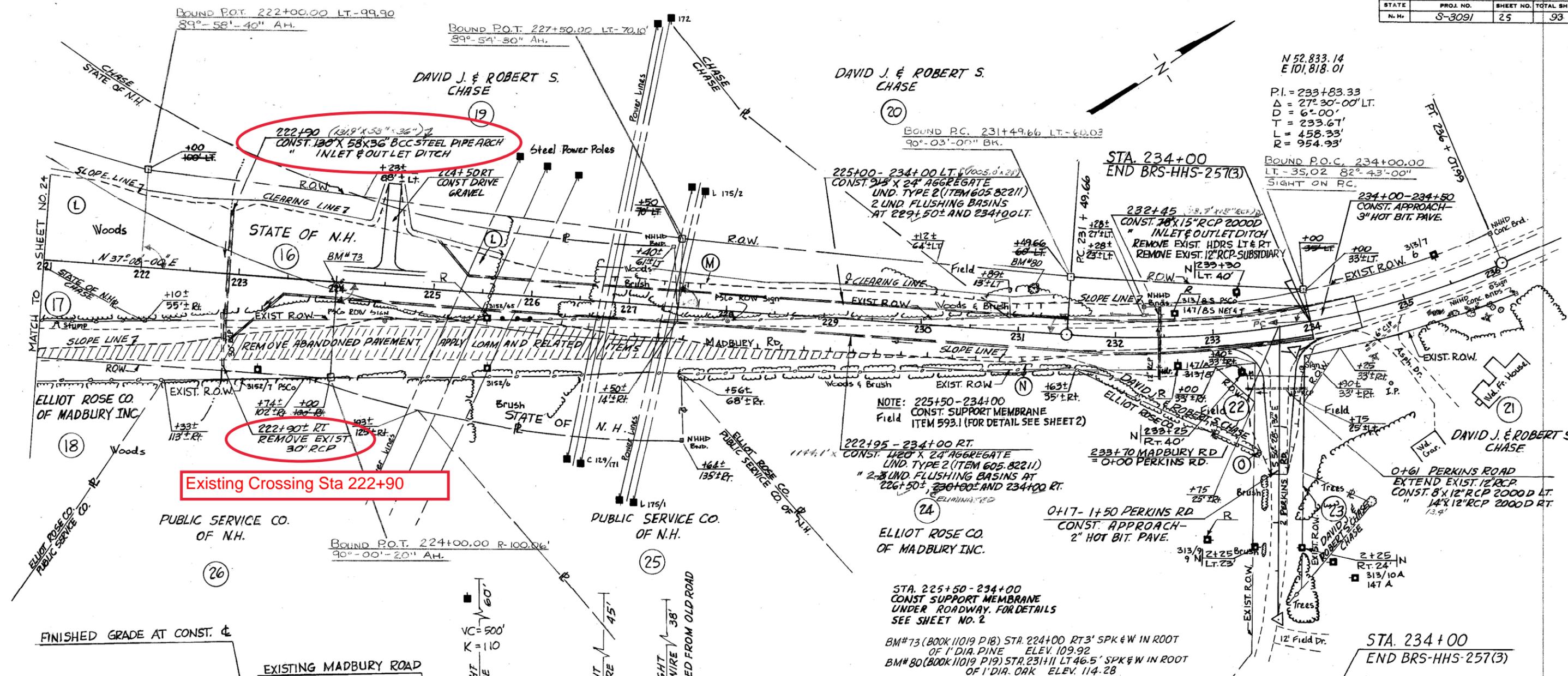
Minimal clearing of trees greater than 3" dbh will be required. No clearing at the inlet is anticipated. Approximately 300 SF of clearing at the outlet is estimated for the small trees and brush along the outlet channel. No grubbing / removal of stumps is anticipated. The vegetation will be allowed to reestablish naturally. Any disturbed jurisdictional areas will be stabilized using wetland seed mix, mulch, and wildlife friendly temporary erosion control matting (where slopes are steeper than 4:1).

Stream flow can be allowed to flow through or be pumped through the existing pipe for most of the project duration and during storm events. In most cases, pipe liners can be installed and grouted with a small amount of flow in the culvert. The Contractor's water diversion plan will address specific means and methods for managing water.

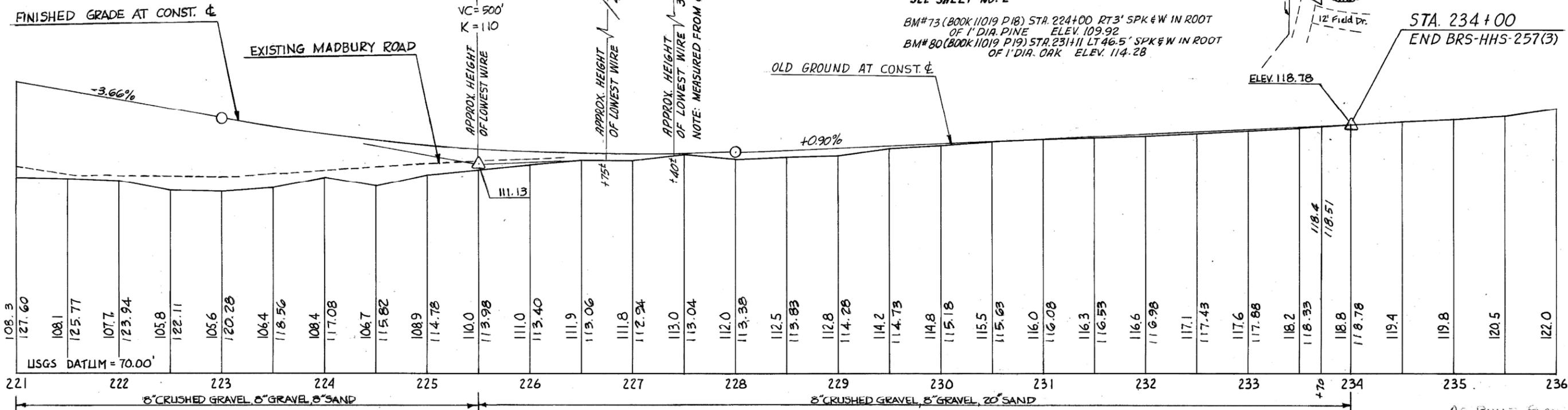
Summary

The proposed work would meet all of the requirements of Env-Wt 904.08 which includes Repair of Existing Legal Tier 2 Crossings, under part (c) which includes slip lining, except that the "no history of flooding" provision is somewhat unclear for this crossing. A beaver blockage at the culvert inlet was reported to have caused flooding of the upstream Town road, but there is no evidence that any damage occurred. The existing culvert also has a dent in the inlet which reduces inlet capacity and the ability of the culvert to pass debris. There is also no evidence that the damaged inlet has caused or contributed to any damage.

Based on the above noted uncertainty in interpretation, This application requests approval for the proposed rehabilitation under Env-Wt 904.10 Alternative Design. The specific requirements of Env-Wt 904.10 are listed and discussed elsewhere in the application.



Existing Crossing Sta 222+90



PLAN CHECKED	DATE	BOOK NO.	PAGE NO.
TOM GILLIGAN	7/31/78	63-78	2-45
PROFILE CHECKED	DATE	BOOK NO.	PAGE NO.
TOM GILLIGAN	7/31/78	1186	2-45
INKED	DATE	BOOK NO.	PAGE NO.
CAROL SABIAN	7/31/78	1186	2-45
CHECKED	DATE	BOOK NO.	PAGE NO.
CAROL SABIAN	7/31/78	1186	2-45

November 18, 2021

SPECIAL PROVISION**AMENDMENT TO SECTION 585 – STONE FILL****Item 585.3401 – Simulated Streambed Material****Add** to Description:

1.2 This work shall consist of furnishing and placing Simulated Streambed Material at the following location on this project:

Simulated Streambed Material shall be placed 6” thick x 5’ wide at the culvert inlet for constructing a simulated stream channel in place of the portion of the culvert that is removed.

1.2.1 The intent is to replicate the natural streambed environments upstream and downstream of the culvert. The percentage of specific stream bed material is based on the visual observations in NHDOT’s Stream Assessment. The gradation of substrate particle sizes is based on the Wentworth scale as referenced in the Guidelines for Naturalized River Channel Design and Bank Stabilization.

Add to Materials:

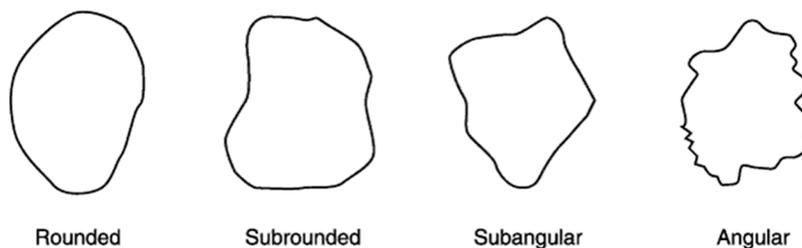
2.1.6 Simulated Streambed Material shall meet the following gradations:

Gradation Upstream, Downstream, and inside the Culvert		
	% by Weight	Sieve Sizes (in)
Silt and Organic	80%	Smaller than #200 sieve
Sand	5%	0.003 to 0.08 (smaller than head of a match)
Gravel	5%	0.08 to 2.5 (between head of match and tennis ball)
Cobble	5%	2.5 to 6.0 (between tennis ball and volleyball)
Boulder	5%	6.0 to 12.0 (max of 12” on any axis)

2.1.6.1 The surface layer of Streambed Material depth shall be 6” nominal thickness, consisting primarily of the sand, silt, and organic gradations. Removal of bedrock and boulders below the streambed finished grade is not required. Any voids below subgrade elevation may be filled with gravel, cobbles, and/or boulders intermixed with Streambed Material.

2.1.6.2 Gravel, Cobble, and Boulder particle shape shall be **Rounded** in accordance with the following:

R = Rounded, Sub-R = Subrounded, Sub-A = Subangular, A = Angular



2.1.6.3 Existing streambed material may be salvaged, stockpiled, and reused under this Item. Boulders removed or excavated around the culvert inlet may be randomly embedded in the subgrade layer.

Add to 3.1:

3.1.3 In accordance with the *Guidelines for Naturalized River Channel Design and Bank Stabilization*, specifically 2.2.1.2 Semi-Natural Form Design, the Streambed Material shall be placed directly on the existing channel floor or subgrade as shown in the contract plans. In cases where scour protection or streambed anchorage material is required the scour/anchorage material shall be placed first. Then the Streambed Material shall be worked into the top 1’-0” filling voids, followed by the depth of Streambed Material specified.

3.1.4 Do not remove streambed material that is not disturbed by other construction operations.

Method of Measurement

Add to Method of Measurement:

4.2 Simulated Streambed Material will be measured by the cubic yard.

Basis of Payment

Add to Basis of Payment:

5.1.1 The accepted quantity of Simulated Streambed Material will be paid for at the Contract unit price per cubic yard complete in place.

Add to Pay Items and Units:

585.3401	Simulated Streambed Material	Cubic Yard
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AVOIDANCE AND MINIMIZATION CHECKLIST

Water Division/Land Resources Management Wetlands Bureau



[Check the Status of your Application](#)

RSA/Rule: RSA 482-A/ Env-Wt 311.07(c)

This checklist can be used in lieu of the written narrative required by Env-Wt 311.07(a) to demonstrate compliance with requirements for Avoidance and Minimization (A/M), pursuant to RSA 482-A:1 and Env-Wt 311.07(c).

For the construction or modification of non-tidal shoreline structures over areas of surface waters without wetland vegetation, complete only Sections 1, 2, and 4 (or the applicable sections in [Attachment A: Minor and Major Projects \(NHDES-W-06-013\)](#)).

The following definitions and abbreviations apply to this worksheet:

- “A/M BMPs” stands for [Wetlands Best Management Practice Techniques for Avoidance and Minimization](#) dated 2019, published by the New England Interstate Water Pollution Control Commission (Env-Wt 102.18).
- “Practicable” means available and capable of being done after taking into consideration cost, existing technology, and logistics in light of overall project purposes (Env-Wt 103.62).

SECTION 1 - CONTACT/LOCATION INFORMATION		
APPLICANT LAST NAME, FIRST NAME, M.I.: NH Dept. of Transportation		
PROJECT STREET ADDRESS: Madbury Road, one half mile north of US Route 4	PROJECT TOWN: Madbury	
TAX MAP/LOT NUMBER: N/A NHDOT ROW		
SECTION 2 - PRIMARY PURPOSE OF THE PROJECT		
Env-Wt 311.07(b)(1)	Indicate whether the primary purpose of the project is to construct a water-access structure or requires access through wetlands to reach a buildable lot or the buildable portion thereof.	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No

irm@des.nh.gov or (603) 271-2147

NHDES Wetlands Bureau, 29 Hazen Drive, PO Box 95, Concord, NH 03302-0095

www.des.nh.gov

If you answered “no” to this question, describe the purpose of the “non-access” project type you have proposed:
 The purpose of this project is to rehabilitate an ageing 58" x 36" x 131' long corrugated metal arch culvert, a valuable state asset, in order to support long term and safe use of the State's public transportation network.

SECTION 3 - A/M PROJECT DESIGN TECHNIQUES

Check the appropriate boxes below in order to demonstrate that these items have been considered in the planning of the project. Use N/A (not applicable) for each technique that is not applicable to your project.

Env-Wt 311.07(b)(2)	For any project that proposes new permanent impacts of more than one acre or that proposes new permanent impacts to a Priority Resource Area (PRA), or both, whether any other properties reasonably available to the applicant, whether already owned or controlled by the applicant or not, could be used to achieve the project’s purpose without altering the functions and values of any jurisdictional area, in particular wetlands, streams, and PRAs.	<input type="checkbox"/> Check <input checked="" type="checkbox"/> N/A
Env-Wt 311.07(b)(3)	Whether alternative designs or techniques, such as different layouts, construction sequencing, or alternative technologies could be used to avoid impacts to jurisdictional areas or their functions and values.	<input checked="" type="checkbox"/> Check <input type="checkbox"/> N/A
Env-Wt 311.07(b)(4) Env-Wt 311.10(c)(1) Env-Wt 311.10(c)(2)	The results of the functional assessment required by Env-Wt 311.03(b)(10) were used to select the location and design for the proposed project that has the least impact to wetland functions.	<input type="checkbox"/> Check <input checked="" type="checkbox"/> N/A
Env-Wt 311.07(b)(4) Env-Wt 311.10(c)(3)	Where impacts to wetland functions are unavoidable, the proposed impacts are limited to the wetlands with the least valuable functions on the site while avoiding and minimizing impacts to the wetlands with the highest and most valuable functions.	<input type="checkbox"/> Check <input checked="" type="checkbox"/> N/A
Env-Wt 313.01(c)(1) Env-Wt 313.01(c)(2) Env-Wt 313.03(b)(1)	No practicable alternative would reduce adverse impact on the area and environments under the department’s jurisdiction and the project will not cause random or unnecessary destruction of wetlands.	<input checked="" type="checkbox"/> Check <input type="checkbox"/> N/A
Env-Wt 313.01(c)(3)	The project would not cause or contribute to the significant degradation of waters of the state or the loss of any PRAs.	<input checked="" type="checkbox"/> Check <input type="checkbox"/> N/A

irm@des.nh.gov or (603) 271-2147

NHDES Wetlands Bureau, 29 Hazen Drive, PO Box 95, Concord, NH 03302-0095

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Env-Wt 313.03(b)(3) Env-Wt 904.07(c)(8)	The project maintains hydrologic connectivity between adjacent wetlands or stream systems.	<input checked="" type="checkbox"/> Check <input type="checkbox"/> N/A
Env-Wt 311.10 A/M BMPs	Buildings and/or access are positioned away from high function wetlands or surface waters to avoid impact.	<input checked="" type="checkbox"/> Check <input type="checkbox"/> N/A
Env-Wt 311.10 A/M BMPs	The project clusters structures to avoid wetland impacts.	<input type="checkbox"/> Check <input checked="" type="checkbox"/> N/A
Env-Wt 311.10 A/M BMPs	The placement of roads and utility corridors avoids wetlands and their associated streams.	<input type="checkbox"/> Check <input checked="" type="checkbox"/> N/A
A/M BMPs	The width of access roads or driveways is reduced to avoid and minimize impacts. Pullouts are incorporated in the design as needed.	<input type="checkbox"/> Check <input checked="" type="checkbox"/> N/A
A/M BMPs	The project proposes bridges or spans instead of roads/driveways/trails with culverts.	<input type="checkbox"/> Check <input checked="" type="checkbox"/> N/A
A/M BMPs	The project is designed to minimize the number and size of crossings, and crossings cross wetlands and/or streams at the narrowest point.	<input type="checkbox"/> Check <input checked="" type="checkbox"/> N/A
Env-Wt 500 Env-Wt 600 Env-Wt 900	Wetland and stream crossings include features that accommodate aquatic organism and wildlife passage.	<input checked="" type="checkbox"/> Check <input type="checkbox"/> N/A
Env-Wt 900	Stream crossings are sized to address hydraulic capacity and geomorphic compatibility.	<input checked="" type="checkbox"/> Check <input type="checkbox"/> N/A
A/M BMPs	Disturbed areas are used for crossings wherever practicable, including existing roadways, paths, or trails upgraded with new culverts or bridges.	<input checked="" type="checkbox"/> Check <input type="checkbox"/> N/A
SECTION 4 - NON-TIDAL SHORELINE STRUCTURES		
Env-Wt 313.03(c)(1)	The non-tidal shoreline structure has been designed to use the minimum construction surface area over surfaces waters necessary to meet the stated purpose of the structure.	<input type="checkbox"/> Check <input checked="" type="checkbox"/> N/A
Env-Wt 313.03(c)(2)	The type of construction proposed for the non-tidal shoreline structure is the least intrusive upon the public trust that will ensure safe navigation and docking on the frontage.	<input type="checkbox"/> Check <input checked="" type="checkbox"/> N/A
Env-Wt 313.03(c)(3)	The non-tidal shoreline structure has been designed to avoid and minimize impacts on the ability of abutting owners to use and enjoy their properties.	<input type="checkbox"/> Check <input checked="" type="checkbox"/> N/A

Env-Wt 313.03(c)(4)	The non-tidal shoreline structure has been designed to avoid and minimize impacts to the public's right to navigation, passage, and use of the resource for commerce and recreation.	<input type="checkbox"/> Check <input checked="" type="checkbox"/> N/A
Env-Wt 313.03(c)(5)	The non-tidal shoreline structure has been designed, located, and configured to avoid impacts to water quality, aquatic vegetation, and wildlife and finfish habitat.	<input type="checkbox"/> Check <input checked="" type="checkbox"/> N/A
Env-Wt 313.03(c)(6)	The non-tidal shoreline structure has been designed to avoid and minimize the removal of vegetation, the number of access points through wetlands or over the bank, and activities that may have an adverse effect on shoreline stability.	<input type="checkbox"/> Check <input checked="" type="checkbox"/> N/A

BUREAU OF ENVIRONMENT CONFERENCE REPORT

SUBJECT: NHDOT Monthly Natural Resource Agency Coordination Meeting

DATE OF CONFERENCE: September 15, 2021

LOCATION OF CONFERENCE: Virtual meeting held via Zoom

ATTENDED BY:

NHDOT

Andrew O'Sullivan
Matt Urban
Rebecca Martin
Arin Mills
Ron Crickard
Mike Dugas
Wendy Johnson
Shelly Winters
Emily Polychronopolous
Sam Newsom
Chris Carucci
Kerry Ryan
Tim Boodey
Joseph Jorgens

ACOE

Absent

EPA

Jeanie Brochi

NHDES

Lori Sommer
Karl Benedict

NHB

Jessica Bouchard

NH Fish & Game

Carol Henderson

Federal Highway

Jaimie Sikora

The Nature Conservancy

Pete Steckler

Consultants/ Public Participants

Christine Perron
Julia Sterns
Kien Ho
Tyler DeRuiter
Jay Doyle
John Bruneau
Jen Riordan
Meg Gordon

PRESENTATIONS/ PROJECTS REVIEWED THIS MONTH: *(minutes on subsequent pages)*

Finalize Meeting Minutes.....	2
Hampton-Portsmouth, 26485 (X-A003(355)).....	2
Claremont, Washington Street Traffic Signal Project, #CMAQ 41748 (X-A004(736)).....	5
Dover Drainage Repair 40042 (Non-federal).....	7
Bedford #43138 (X-A005(049)).....	8
Nashua-Manchester, #40818 (Capital Corridor Rail)	11
Madbury, #43276, (X-0005(068)).....	15

- No comments due to FHWA not funding the project

Jessica Bouchard (NH Natural Heritage Bureau)

- Asked GM2 to send a record of previous communication between GM2 and NHB.
- Asked if GM2 was aware of the two new species listed in the 2021 NHB report and whether GM2 surveyed for them. Jenn Riordan confirmed that these species were included in the field surveys.
- Suggested doing an additional survey for Wright's spikesedge once Merrimack River shoreline impacts have been determined.
- Seconded Lori's comment about not preferring the Pine Grove Cemetery location for a layover site due to potential indirect impacts to the exemplary natural community.

Pete Steckler (The Nature Conservancy)

- Agreed with Carol about consulting with the NH Fish and Game Nongame Program. Noted that wildlife corridor and connectivity maps are being produced that could be useful to the project.

This project has not been previously discussed at the Monthly Natural Resource Agency Coordination Meetings.

Madbury, #43276, (X-0005(068))

Chris Carucci, NHDOT Highway Design, gave an overview of the proposed federally funded culvert rehabilitation project. The culvert carries Beards Creek under Madbury Road, approximately 0.5 miles north of US Route 4, and is a Tier 2 crossing. The existing culvert is a 58" wide x 36" high x 131' long corrugated metal arch pipe constructed in 1980. The pipe is in poor condition with heavy rust, some perforations, and damage to the inlet end. There was no perch at the culvert inlet or outlet.

A Town owned crossing, located approximately 175' upstream on Sarah Paul Road, was also described.

NHDOT District 6 Maintenance reports no history of flooding related to the State culvert. Discussion with the Town Road Agent indicated no recent history of flooding of the Town Road, except for one time when the State culvert was blocked by beavers. A stream assessment was completed by NHDOT on 5/27/2021, finding the stream to be a Rosgen Type E immediately upstream of the crossing. Immediately downstream, the channel is not natural, as it was constructed as part of the roadway embankment. The reference reach was farther upstream of the inlet and was classified as Type F. Bankfull widths averaged 4.6' at the crossing and 5.6' for the reference reach. The reference reach data and entrenchment ratio range of 1.0 to 1.4 was used to determine the compliant span range of 5.6' to 7.8'. An 8' span was used to evaluate the compliant design option. The environmental review identified the potential presence of rare species, invasive species, and limited re-use soils (LRS), and potential coordination for Section 106, water quality requirements, Alteration of Terrain (AOT) requirements, and essential fish habitat (EFH). Floodplains, protected shoreland buffer, prime wetlands, designated rivers, and conservation lands were not identified.

Existing hydrology and hydraulics were outlined in conjunction with the culvert, stream, and road profiles. Streamstats reports drainage area at 0.42 sq mi (268.5 acres). Review of LIDAR contours found additional contributing area in the upper watershed, making the total area used for analysis 376.3 acres, or about 0.588 Sq miles. Streamstats predicts Q100 at 106 cfs using the revised 376 ac

boundary. The FHWA Regression Equations predict Q100 between 97 and 137 cfs. The SCS Method (Hydrocadd) was used for preliminary analysis, with Q100 predicted at 200 cfs. The existing culvert can pass the 100 year storm without overtopping Madbury Road. The Town crossing would be overtopped using the conservative (200 cfs) flow. The State culvert has slight backwater effect on the Town crossing, but it would not be the primary cause of the Town road being overtopped.

Considered alternatives were described including replacement with a compliant span structure and rehabilitation by sliplining. Sliplining options included polymer coated CMP liner, GRP custom size liner, and cured in place liner. Hydraulic performance of the rehabilitation alternatives was compared. The corrugated metal pipe liner was identified as the preferred alternative.

The proposed design will remove a portion of the damaged inlet end, shortening the culvert by about 7', and creating a more hydraulically efficient headwall at the inlet. The area of pipe removed will be replaced with simulated streambed material for the channel bottom and vegetated side slopes.

The remaining 124 LF of culvert will be sliplined with a 49" wide x 33" high polymer coated corrugated metal arch pipe liner. The space between the host pipe and liner will be filled with grout. The liner inverts will be about 2" higher than the existing pipe inverts.

The proposed rehabilitation will not have a significant effect on capacity or velocity. There will be no significant effect on the frequency of flooding, or sediment transport. There will be no permanent effect to the stream channel or adjacent wetlands and there will be no perch when the work is complete. All work will be within the existing ROW.

Access to the culvert will be from the edges of Madbury Rd. Slopes are relatively flat maintained grass, so no special access concerns are expected. Minimal clearing of trees greater than 3" dbh will be required. 300 SF of clearing at the outlet is estimated for the small trees and brush along the outlet channel. No grubbing / removal of stumps is anticipated. The project will be under the 1 acre threshold for earth disturbance for CGP coverage. Total disturbed area is estimated at 19,500 SF (0.44 acres). No disturbance to existing paved areas.

Temporary Impacts will be required for access, water diversion, and erosion controls, with the upstream limit along the existing woods line, to a distance of about 50' left and right of the inlet. The downstream limit is at the ROW line, about 30' from the existing outlet.

Total Temporary Impacts will be about 1,436 SF. Total Temporary LF impacts will be about 189 LF.

Concurrence was requested for project consistency under 904.08 and that there is no required mitigation.

Karl Benedict, NHDES Wetlands Bureau, asked if the upstream structure might be replaced in the future and if so would the replacement be considered in this proposed project, agreed with the preferred alternative, stated an alternative design should be considered, the need to consider terrestrial passage referencing to consider whatever Pete and Carol may have for comments, and asked about the extent of clearing at the outlet. C. Carucci responded that it is not anticipated the upstream structures would be replaced in the near future, clearing will be limited to small trees and brush at the outlet which will be allowed to grow back, and that an alternative design will also be considered. K. Benedict agreed that either 904.08 or an alternative design would not change the proposed impacts.

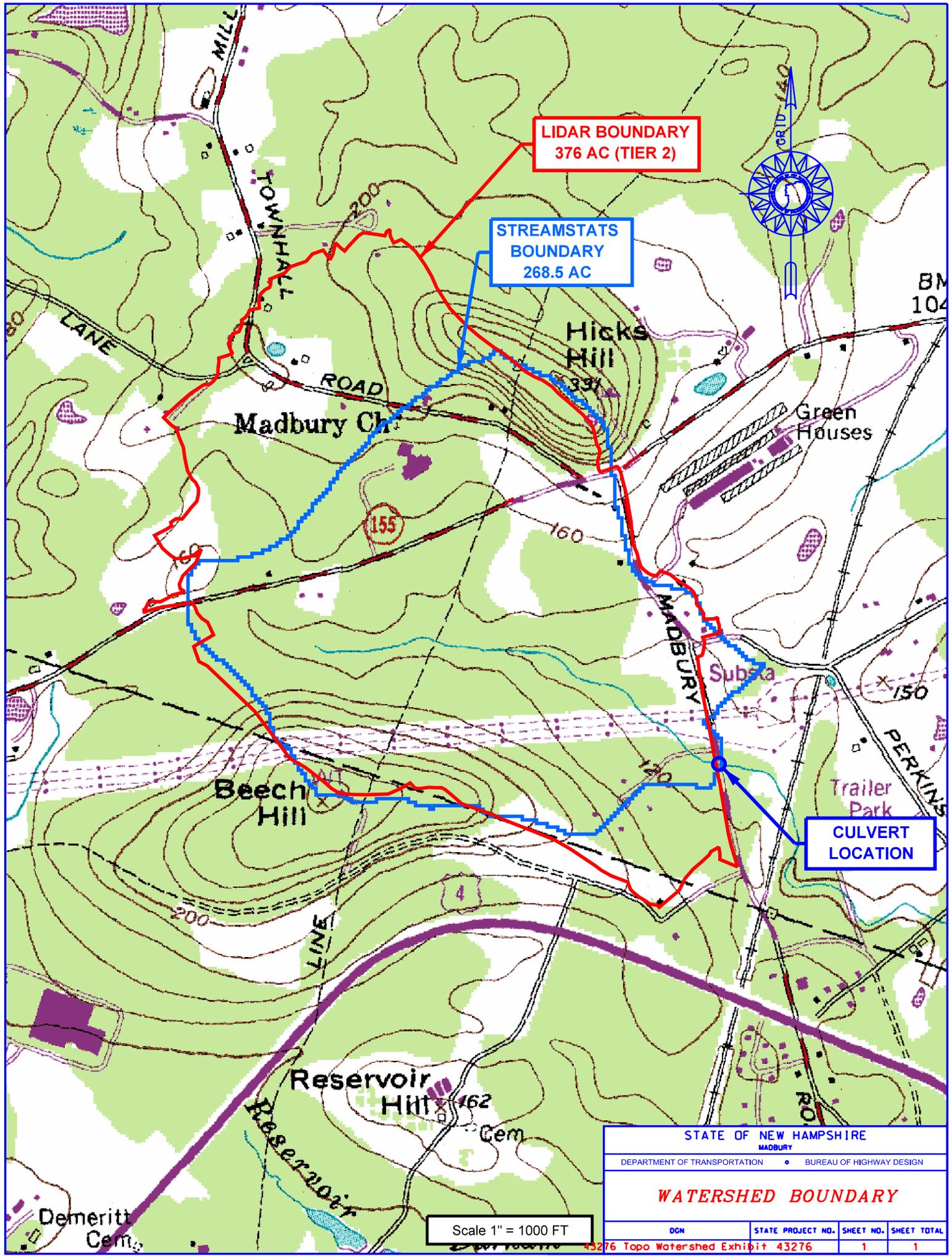
Lorie Sommer, NHDES Wetlands Bureau stated that if Karl's concerns could be addressed and if it could go alternative design mitigation is not required.

Carol Henderson, NHFG stated it didn't appear there was room in the culvert to address terrestrial passage and more details were needed regarding the species identified on the Natural Heritage Bureau (NHB) report. Kerry Ryan, NHDOT Bureau of Environment, stated coordination with NHFG had begun and will continue once the preferred alternative was agreed upon.

Jeanie Brochi from Environmental Protection Agency (EPA) had no comments.

A response was not received from Jamie Sikoria (FHWA) and Jessica Bouchard (NHB) when asked if they had comments.

Pete Steckler, The Nature conservancy (TNC), asked if the project could be postponed and could the 4' x 8' structure be considered if funding was not an issue in order to see how the new federal funding plays out. C. Carucci replied that the culvert is in poor condition and needs to be fixed as soon as possible to prevent failure.



LIDAR BOUNDARY
376 AC (TIER 2)

STREAMSTATS BOUNDARY
268.5 AC

CULVERT LOCATION

STATE OF NEW HAMPSHIRE
MADBURY

DEPARTMENT OF TRANSPORTATION • BUREAU OF HIGHWAY DESIGN

WATERSHED BOUNDARY

Scale 1" = 1000 FT

DGN	STATE PROJECT NO.	SHEET NO.	SHEET TOTAL
43276 Topo Watershed Exhibit	43276	1	1

**NH Department of Transportation
Bureau of Highway Design
Project, #43276 Madbury
Env-Wt 904.10 Alternative Design
TECHNICAL REPORT
For Rehabilitation of an Existing Tier 1 or Tier 2 Legal Crossing
Prepared by: C. Carucci, PE**

See the Supplemental Narrative for additional information related to the responses below.

Env-Wt 904.10(a) - If the applicant can demonstrate that installing the structure specified in the applicable rule is not practicable, as that term is defined in Env-Wt 103, the applicant may propose an alternative design in accordance with this section.

Please explain why the structure specified in the applicable rule (*a compliant structure*) is not practicable. Practicable is defined as *available and capable of being done after taking into consideration costs, existing technology, and logistics in light of overall project purposes.*)

This project was initiated and is funded under NHDOT's Federal Culvert Replacement/Rehabilitation & Drainage Repair (CRDR) Program. The Program purpose is to address major culvert and drainage needs statewide that are not being addressed through current or future Capital Improvement or other programmatic projects. The Program receives \$2,000,000 in total funding annually, which includes construction, engineering, and ROW costs. Projects are selected and scheduled based primarily on the condition of the culvert (risk of failure), Road Tier, traffic volume, depth of fill, and detour length (potential impact of failure). The Program funding is fully committed to multiple Projects for at least the next three years. This culvert is one of the highest statewide priority locations out of nearly 50 known locations eligible for the Program. Failure to address the structural deficiency of this culvert risks deformation of the culvert which would make rehabilitation impossible and/or collapse of the culvert which could cause serious impacts to public/private infrastructure and the travelling public. Alternatives that significantly exceed the Project budget are not practicable. See the Supplemental Narrative for detailed information on alternatives and costs.

Env-Wt 904.10(b)(1) – Clearly explain how the proposed alternative meets the criteria for approval specified in Env-Wt 904.10(d):

Env-Wt 904.10(d)(1) – Demonstrate that adhering to the rules is not practicable:

The applicable Rule for Rehabilitation of a Tier 2 Existing Legal Crossing is **Env-Wt 904.08.**

Env-Wt 904.08 (b)(1) – The existing stream crossing does not have a history of causing or contributing to flooding that damages the crossing, other infrastructure, or protected species or habitat, or any combination thereof;

NHDOT District 5 Maintenance reports no history of flooding related to this culvert. A beaver blockage at the culvert inlet was reported to have caused flooding of the upstream Town road, but there is no evidence that any damage occurred. The existing culvert also has a dent in the inlet which reduces inlet capacity and the ability of the culvert to pass debris. There is also no evidence that the damaged inlet has

caused or contributed to any damage. It is not clear whether the existing culvert meets the requirements of 904.08 (b)(1).

Env-Wt 904.08 (b)(2)a – The proposed stream crossing will meet or exceed the general criteria specified in Env-Wt 904.01:

Env-Wt 904.01 General Design Considerations

(a) All stream crossings, whether over tidal or non-tidal waters, shall be designed and constructed so as to:

1) Not be a barrier to sediment transport;

The proposed design has no features that would be a barrier to sediment transport. The existing culvert has been in service for 41 years, with no evidence of obstructing sediment transport. The proposed liner will have slightly higher velocities over a range of flows which will improve sediment transport.

2) Not restrict high flows and maintain existing low flows;

The proposed liner will maintain existing high flow and low flow hydraulic capacities with similar flow depths.

3) Not obstruct or otherwise substantially disrupt the movement of aquatic life indigenous to the waterbody beyond the actual duration of construction;

The proposed liner will not obstruct the movement of aquatic life indigenous to the waterbody. The areas immediately adjacent to the culvert inlet and outlet match the existing culvert inverts and the liner inverts will be set to closely match the existing c/p inverts. Velocities within the culvert will increase slightly as a result of the smaller liner diameter, but not enough to affect passage. The proposed design will not significantly change low flow conditions. With all of this in mind, current passage of aquatic life is not inhibited by the existing culvert and will remain the same post construction.

4) Not cause an increase in the frequency of flooding or overtopping of banks;

The proposed liner will have approximately the same hydraulic capacity as the existing culvert. The effect of the smaller liner diameter will be offset by shortening the culvert and constructing a more efficient headwall at the inlet. The proposed rehabilitation will not have a significant effect on flood flow or flood elevations upstream or downstream of the existing culvert.

5) Maintain or enhance geomorphic compatibility by:

a. Minimizing the potential for inlet obstruction by sediment, wood, or debris; and

The existing culvert does not have a history of debris blockage, but there are reports of blockage by beaver activity. The existing inlet has minor damage to one side which increases the potential for debris blockage. The proposed rehabilitation will remove the damaged portion of pipe at the inlet and construct a concrete headwall with 45° wings. This type of headwall is a typical inlet structure, which is tapered to improve hydraulic efficiency and help funnel debris through the culvert. The culvert slope closely matches the approach channel slope, which reduces the potential for sediment accumulation.

b. Preserving the natural alignment of the stream channel;

The proposed design will not alter the existing culvert alignment. The existing culvert is approximately perpendicular to Madbury Road, as constructed by the 1980 project. The 1980 project widened and realigned Madbury Road and replaced the 30" concrete culvert

carrying Beards Creek with the current 58" x 36" cnp arch culvert. (see Supplemental Narrative Exhibit 1 - Archive Plan). The existing culvert does not align well with the low flow channel at the inlet, but does align well with the outlet channel. Since rehabilitating the existing structure is the proposed scope of work, improving the culvert alignment is not feasible with this project. This project is not making the alignment worse.

6) Preserve watercourse connectivity where it currently exists;

The proposed design will not alter connectivity. The liner invert will be set as close to the same elevation as the existing culvert invert as practical. The inlet area will be regraded such that the streambed matches the liner invert. The existing outlet invert is about 2" below streambed due to some minor accumulation of sediment in the culvert. The slightly higher liner invert will closely match the existing outlet channel elevation such that there is no perch.

7) Restore watercourse connectivity where:

a. Connectivity previously was disrupted as a result of human activity(ies); and
Connectivity of low flows and the hydrologic connection was maintained by the existing culvert. It is not practicable to restore vegetated banks, buffers, or floodplain inside of the existing culvert.

b. Restoration of connectivity will benefit aquatic life upstream or downstream of the crossing, or both;

The proposed rehabilitation will not alter existing connectivity.

8) Not cause erosion, aggradation, or scouring upstream or downstream of the crossing; and

The proposed design will have no effect on upstream hydraulics or sediment transport through the culvert. Outlet velocities will increase slightly as a result of the smaller liner diameter, but no effect on the downstream channel is anticipated. No changes to the upstream or downstream channels are proposed.

9) Not cause water quality degradation.

The project will have no effect on water quality. No new pavement or changes to drainage patterns is being proposed.

(b) For stream crossing over tidal waters, the stream crossing shall be designed to:

1) Match the velocity, depth, cross-sectional area, and substrate of the natural stream: and

N/A – This is not a tidal crossing

2) Be of sufficient size to not restrict bi-directional tidal flow over the natural tide range above, below, and through the crossing.

N/A – This is not a tidal crossing

Env-Wt 904.08 (b)(2)b - The proposed stream crossing will maintain or enhance the hydraulic capacity of the crossing:

Hydraulic capacity for the rehabilitated culvert will be about the same as existing. The addition of a beveled edge inlet headwall will result in a slight capacity increase.

Env-Wt 904.08 (b)(2)c - The proposed stream crossing will maintain or enhance the capacity of the crossing to accommodate aquatic organism passage, or both:

The proposed rehabilitation will maintain the existing capacity to accommodate aquatic organism passage. The proposed liner will have a corrugated interior and there will be no significant change to flow conditions. There will be no perch at the inlet or outlet. Shortening the culvert by 7' could be considered a slight enhancement.

Env-Wt 904.08 (b)(2)d - The proposed stream crossing will maintain or enhance the connectivity or the stream reaches upstream or downstream of the crossing, or both:

The proposed rehabilitation will maintain the existing connectivity between the upstream and downstream reaches. The proposed liner will have the same type of corrugated interior as the existing culvert and there will be no significant change to flow conditions. There will be no perch at the inlet or outlet.

Env-Wt 904.08 (b)(2)e - The proposed stream crossing will not cause an increase in the frequency of flooding or overtopping of banks upstream or downstream of the crossing, or both:

The proposed liner will have approximately the same hydraulic capacity as the existing culvert. The effect of the smaller liner diameter will be offset by shortening the culvert and constructing a more efficient headwall at the inlet. The proposed rehabilitation will not have a significant effect on flood flow or flood elevations upstream or downstream of the existing culvert.

Env-Wt 904.10(d)(2)a – The proposed alternative design meets the general design criteria established in Env-Wt 904.01:

See responses above.

Env-Wt 904.10(d)(2)b - The proposed alternative design meets the applicable design criteria established in Env-Wt 904.07 for Tier 2 stream crossings to the *maximum extent practicable*, as specified below.

Env-Wt 904.07 Design Criteria for Tier 2, Tier 3, and Tier 4 Stream Crossings

(a) Unless otherwise specified, all design criteria in this section shall apply to new and replacement tier 2, tier 3, and tier 4 crossings.

This is not a new or replacement crossing. The proposed rehabilitation meets all of the requirements to the maximum extent practicable.

(b) Tier 2 and tier 3 stream crossings shall be designed in accordance with the NH Stream Crossing Guidelines.

As this is not a new or replacement crossing, there is little to no opportunity to modify the crossing to better match the NH Stream Crossing Guidelines.

(c) Tier 2, tier 3, and tier 4 stream crossings shall be designed:

1) To meet the general design considerations specific in En-Wt 904.01;

See responses above.

- 2) Of sufficient size to accommodate the greater of:
 - a. The 100-year 24-hour design storm;
 - b. Flows sufficient to:
 1. Prevent an increase in flooding on upstream and downstream properties; and
 2. Not affect flows and sediment transport characteristics in a way that would adversely affect channel stability; or
 - c. Applicable federal, state, or local requirements;

The rehabilitated crossing will accommodate the 100-year 24-hour storm flow without bypass or overtopping of Madbury Road.

The rehabilitated culvert will have about the same capacity as the existing culvert. There will be no change to upstream or downstream flooding as a result of the proposed rehabilitation.

The existing culvert has performed well for 41 years, with no evidence of obstructing sediment transport or causing channel instability. The proposed design will not significantly alter sediment transport capacity or flow conditions.

The rehabilitated culvert will meet NHDOT requirements for this type of crossing (50-year storm).

- 3) With bed forms and streambed characteristics necessary to cause water depths and velocities within the crossing structure at a variety of flows to be comparable to those found in the natural channel upstream and downstream of the stream crossing.

It is not practicable to cause water depths and velocities within the crossing structure at a variety of flows to be comparable to those found in the natural channel upstream and downstream of the stream crossing since the crossing is a closed bottom structure and will remain closed bottom. The selection of the liner material provides the best available balance between capacity and velocity. The portion of stream channel created by shortening the culvert will match the bed form and streambed characteristics of the upstream channel.

- 4) To provide a vegetated bank on both sides of the watercourse or to provide a wildlife shelf of suitable substrate and access to allow for wildlife passage.

It is not practicable to provide a vegetated bank on both sides of the watercourse or to provide a wildlife shelf inside the existing culvert due to capacity constraints.

- 5) To preserve the natural alignment and gradient of the stream channel, so as to accommodate natural flow regimes and the functioning of the natural floodplain.

It is not practicable to alter the alignment or gradient of the existing culvert to restore the natural alignment of the stream that it once was prior to the original culvert installation. The proposed rehabilitation maintains the existing alignment and gradient of the crossing.

- 6) To simulate a natural stream channel.

It is not practicable to simulate a natural stream channel inside the existing culvert. The existing culvert is a closed bottom corrugated metal culvert. The rehabilitated culvert will be a closed bottom corrugated metal culvert.

7) So as not to alter sediment transport competence.

The proposed design will not have a significant effect on sediment transport competence. Existing culvert velocities are sufficient to prevent aggregation of sediment inside the culvert. Proposed liner velocities will be slightly higher than the existing velocities.

8) To avoid and minimize impacts to the stream in accordance with Env-Wt 313.03

The project was designed to avoid and minimize wetland impacts to the maximum extent practicable. Additional details are provided in the Avoidance and Minimization checklist included elsewhere in the application.

(d) In addition to meeting the criteria specified in (c), above, new, repaired, rehabilitated, or replaced tier 4 stream crossing shall be designed:

N/A – Crossing is not a Tier 4

Env-Wt 904.10(d)(2)c – A hydraulic analysis shows that the proposed stream crossing can accommodate the applicable design storm or that the crossing, together with the associated roadway and roadway embankment, can safely accommodate overtopping flows:

See the Supplemental Narrative for detailed information about hydraulic modelling and associated model results.

The rehabilitated crossing will accommodate the 100-year 24-hour storm flow without bypass or overtopping of Madbury Road. Of the three runoff methods considered, this is the most conservative estimate of the 100-year storm flow.

The applicable design storm per NHDOT requirements is a 50-year storm, using USGS Streamstats for the 50-year design flow. The rehabilitated culvert will accommodate the 50-year storm with an acceptable upstream headwater elevation and without bypass or overtopping.



WETLANDS PERMIT APPLICATION STREAM CROSSING WORKSHEET

Water Division/Land Resources Management
Wetlands Bureau



RSA/Rule RSA 482-A/ Env-Wt-900

This worksheet can be used to accompany Wetlands Permit Applications when proposing stream crossings.

SECTION 1 - TIER CLASSIFICATIONS	
Determine the contributing watershed size at USGS StreamStats .	
Note: Plans for tier 2 and 3 crossings shall be designed and stamped by a professional engineer who is licensed under RSA 310-A to practice in New Hampshire.	
Size of contributing watershed at the crossing location: 376 acres	
<input type="checkbox"/> Tier 1: A tier 1 stream crossing is a crossing located on a watercourse where the contributing watershed size is less than or equal to 200 acres.	
<input checked="" type="checkbox"/> Tier 2: A tier 2 stream crossing is a crossing located on a watercourse where the contributing watershed size is greater than 200 acres and less than 640 acres.	
<input type="checkbox"/> Tier 3: A tier 3 stream crossing is a crossing that meets any of the following criteria: <ul style="list-style-type: none"> <input type="checkbox"/> On a watercourse where the contributing watershed is more than 640 acres. <input type="checkbox"/> Within a designated river corridor unless: <ul style="list-style-type: none"> a. The crossing would be a tier 1 stream based on contributing watershed size, or b. The structure does not create a direct surface water connection to the designated river as depicted on the national hydrography dataset as found on GRANIT. <input type="checkbox"/> Within a 100-year floodplain (see Section 2 below). <input type="checkbox"/> In a jurisdictional area having any protected species or habitat (NHB DataCheck). <input type="checkbox"/> In a prime wetland or within a duly-established 100-foot buffer, unless a waiver has been granted pursuant to RSA 482-A:11, IV(b) and Env-Wt 706. Review the Wetlands Permit Planning Tool (WPPT) for town prime wetland and prime wetland buffer maps to determine if your project is within these areas. 	
<input type="checkbox"/> Tier 4: A tier 4 stream crossing is a crossing located on a tidal watercourse.	
SECTION 2 - 100-YEAR FLOODPLAIN	
Use the FEMA Map Service Center to determine if the crossing is located within a 100-year floodplain. Please answer the questions below:	
<input checked="" type="checkbox"/> No: The proposed stream crossing <i>is not</i> within the FEMA 100-year floodplain.	
<input type="checkbox"/> Yes: The proposed project <i>is</i> within the FEMA 100-year floodplain. Zone = <input type="text"/> Elevation of the 100-year floodplain at the inlet: <input type="text"/> feet (FEMA El. or Modeled El.)	
SECTION 3 - CALCULATING PEAK DISCHARGE	
Existing 100-year peak discharge (Q) calculated in cubic feet per second (CFS): 106 CFS	Calculation method: Streamstats
Estimated bankfull discharge at the crossing location: 19.3 CFS	Calculation method: Streamstats 2-year

lrn@des.nh.gov or (603) 271-2147

NHDES Wetlands Bureau, 29 Hazen Drive, PO Box 95, Concord, NH 03302-0095

www.des.nh.gov

➡ **Note: If tier 1, then skip to Section 10** ⬅

SECTION 4 - PREDICTED CHANNEL GEOMETRY BASED ON REGIONAL HYDRAULIC CURVES

For tier 2, tier 3 and tier 4 crossings only.

Bankfull Width: 9.6 feet Mean Bankfull Depth: 1.1 feet

Bankfull Cross Sectional Area: 10.7 square feet (SF)

SECTION 5 - CROSS SECTIONAL CHANNEL GEOMETRY: MEASUREMENTS OF THE EXISTING STREAM WITHIN A REFERENCE REACH

For tier 2, tier 3 and tier 4 crossings only.

Describe the reference reach location: upstream

Reference reach watershed size: 376 acres

Parameter	Cross Section 1 Describe bed form <u>run</u> (e.g. pool, riffle, glide)	Cross Section 2 Describe bed form <u>run</u> (e.g. pool, riffle, glide)	Cross Section 3 Describe bed form <u>riff</u> (e.g. pool, riffle, glide)	Range
Bankfull Width	5 feet	3 feet	7 feet	3-7 feet
Bankfull Cross Sectional Area	3.2 SF	1 SF	2.3 SF	1-3.2 SF
Mean Bankfull Depth	0.64 feet	0.33 feet	0.33 feet	0.33-0.64 feet
Width to Depth Ratio	7.8	9	21.3	7.8-21.3
Max Bankfull Depth	1.3 feet	0.4 feet	0.5 feet	0.4-1.3 feet
Flood Prone Width	10 feet	7.7 feet	9 feet	7.7-10.0 feet
Entrenchment Ratio	2	2.6	1.3	1.3-2.6

Use **Figure 1** below to determine the measurements of the Reference Reach Attributes

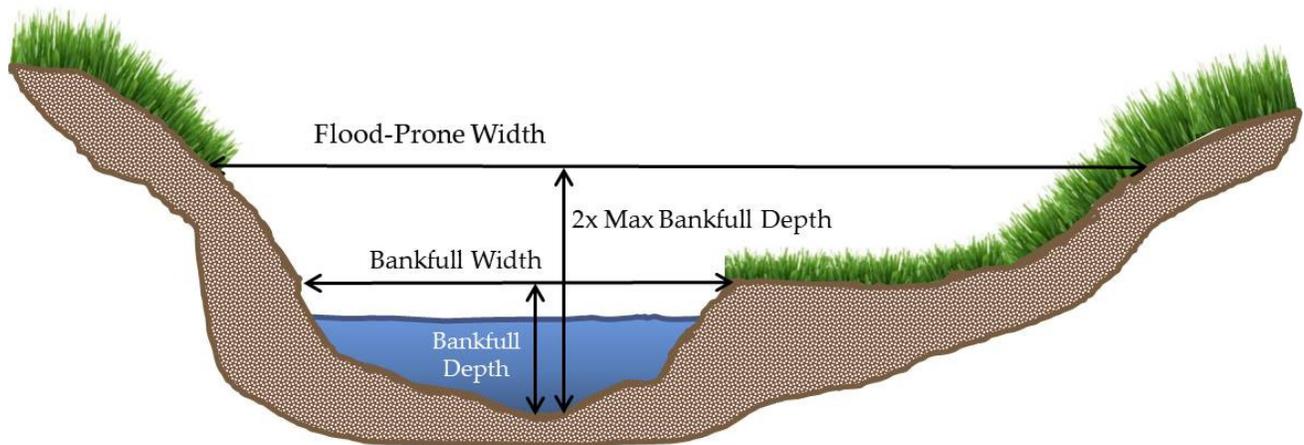


Figure 1: Determining the Reference Reach Attributes.

SECTION 6 - LONGITUDINAL PARAMETERS OF THE REFERENCE REACH AND CROSSING LOCATION

For tier 2, tier 3 and tier 4 crossings only.

Average Channel Slope of the Reference Reach: 0.2%

Average Channel Slope at the Crossing Location: 0.5% (downstream)

SECTION 7 - PLAN VIEW GEOMETRY

Note: Sinuosity is measured a distance of at least 20 times bankfull width, or 2 meander belt widths.

For tier 2, tier 3 and tier 4 crossings only.

Sinuosity of the Reference Reach: 1.1	
Sinuosity of the Crossing Location: 1.2	
SECTION 8 - SUBSTRATE CLASSIFICATION BASED ON FIELD OBSERVATIONS	
<i>For tier 2, tier 3 and tier 4 crossings only.</i>	
% of reach that is bedrock:	0 %
% of reach that is boulder:	0 %
% of reach that is cobble:	0 %
% of reach that is gravel:	3 %
% of reach that is sand:	10 %
% of reach that is silt:	87 %
SECTION 9 - STREAM TYPE OF REFERENCE REACH	
<i>For tier 2, tier 3 and tier 4 crossings only.</i>	
Stream Type of Reference Reach:	B

Refer to Rosgen Classification Chart (**Figure 2**) below:

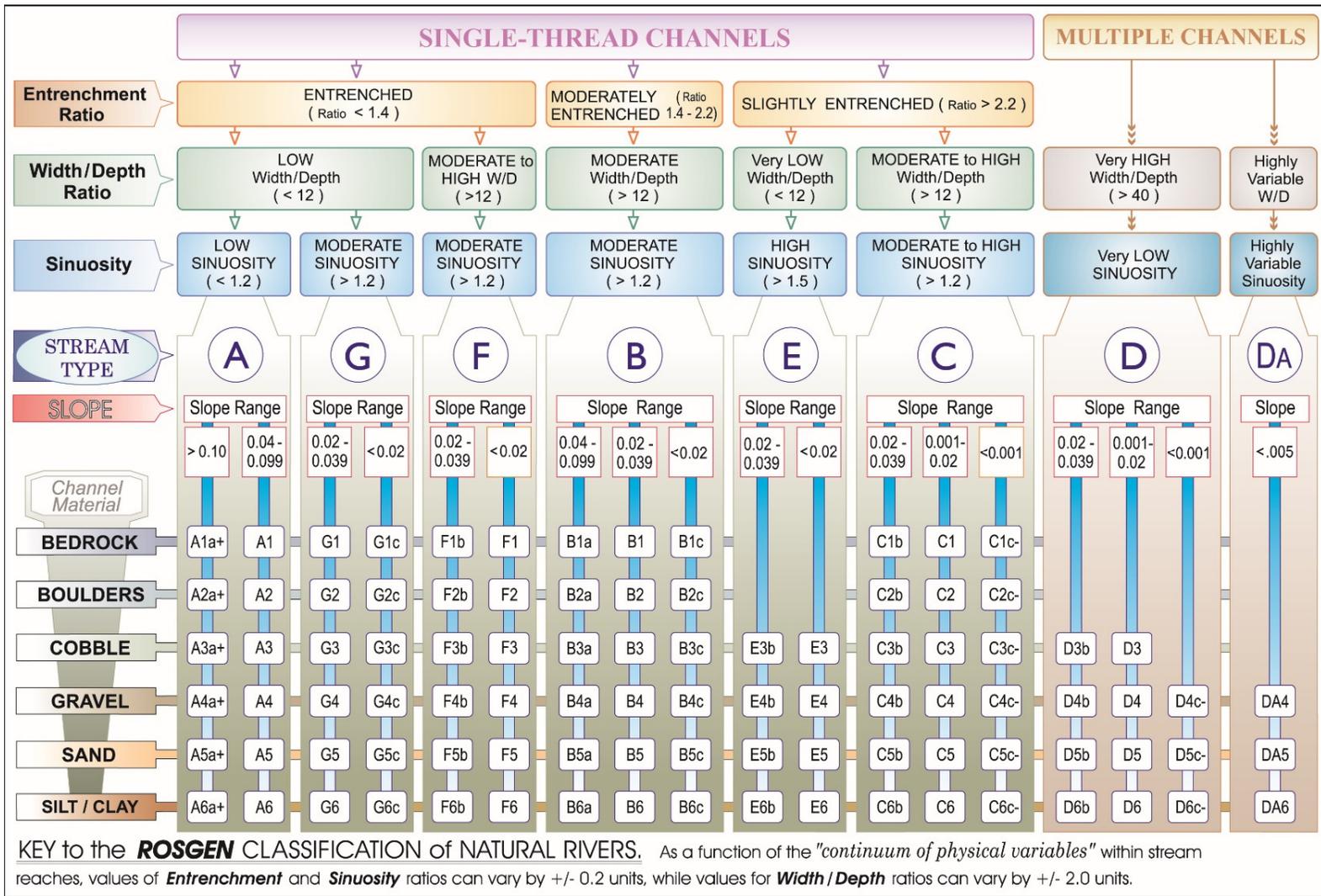


Figure 2: Reference from Applied River Morphology, Rosgen, 1996.

SECTION 10 - CROSSING STRUCTURE METRICS					
Existing Conditions	Existing Structure Type:	<input type="checkbox"/> Bridge span <input type="checkbox"/> Pipe arch <input type="checkbox"/> Open-bottom culvert <input checked="" type="checkbox"/> Closed-bottom culvert <input type="checkbox"/> Closed-bottom culvert with stream simulation <input type="checkbox"/> Other: <input type="checkbox"/>			
	Existing Crossing Span: (perpendicular to flow)	4.83 feet	Culvert Diameter: 58" x 36" cmp arch feet		
	Existing Crossing Length: (parallel to flow)	131 feet	Inlet Elevation: El. 105.02 feet		
Proposed Conditions	Existing Crossing Length: (parallel to flow)	131 feet	Outlet Elevation: El. 103.92 feet		
	Existing Crossing Length: (parallel to flow)	131 feet	Culvert Slope: 0.84%		
	Proposed Structure Type:	Tier 1	Tier 2	Tier 3	Alternative Design
	Bridge Span	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Pipe Arch	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>
	Closed-bottom Culvert	<input type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>
Open-bottom Culvert	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Closed-bottom Culvert with stream simulation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Proposed Structure Span:	4.1 feet	Culvert Diameter: 49" x 33" cmp liner feet			

(perpendicular to flow)	Inlet Elevation: El. 105.13 feet
Proposed Structure Length: 124 feet (parallel to flow)	Outlet Elevation: El. 104.09 feet Culvert Slope: 0.84%
Proposed Entrenchment Ratio: * no change to stream <i>For Tier 2, Tier 3 and Tier 4 Crossings Only. To accommodate the entrenchment ratio, floodplain drainage structures may be utilized.</i>	

* Note: Proposed Entrenchment Ratio must meet the minimum ratio for each stream type listed in **Figure 3**, otherwise the applicant must address the Alternative Design criteria listed in Env-Wt 904.10.

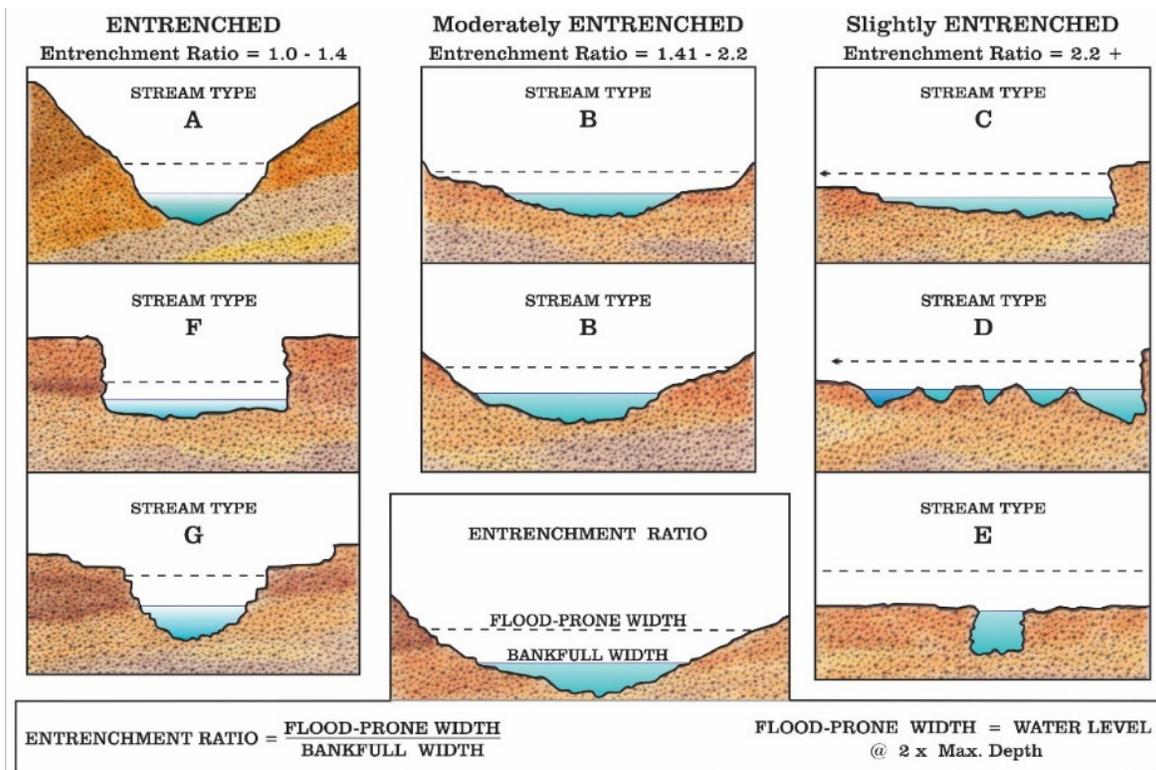


Figure 3: Reference from Applied River Morphology, Rosgen, 1996.

SECTION 11 - CROSSING STRUCTURE HYDRAULICS		
	Existing	Proposed
100 year flood stage elevation at inlet:	111.70	111.62
Flow velocity at outlet in feet per second (FPS):	9.2	11.1
Calculated 100 year peak discharge (Q) for the <i>proposed</i> structure in CFS:		95.2
Calculated 50 year peak discharge (Q) for the <i>proposed</i> structure in CFS:		76.0
SECTION 12 - CROSSING STRUCTURE OPENNESS RATIO		
<i>For tier 2, tier 3 and tier 4 crossings only.</i>		
Crossing Structure Openness Ratio* = 8.9 sf / 124' = 0.07		
* Openness box culvert = (height x width)/length Openness round culvert = (3.14 x radius ²)/length		

SECTION 13 - GENERAL DESIGN CONSIDERATIONS

Env-Wt 904.01 requires all stream crossings to be designed and constructed according to the following requirements. Check each box if the project meets these general design considerations.

All stream crossings shall be designed and constructed so as to:

- Not be a barrier to sediment transport.
- Prevent the restriction of high flows and maintain existing low flows.
- Not obstruct or otherwise substantially disrupt the movement of aquatic life indigenous to the waterbody beyond the actual duration of construction.
- Not cause an increase in the frequency of flooding or overtopping of banks.
- Maintain or enhance geomorphic compatibility by:
 - a. Minimizing the potential for inlet obstruction by sediment, wood, or debris, and
 - b. Preserving the natural alignment of the stream channel.
- Preserve watercourse connectivity where it currently exists.
- Restore watercourse connectivity where:
 - a. Connectivity previously was disrupted as a result of human activity(ies), and
 - b. Restoration of connectivity will benefit aquatic life upstream or downstream of the crossing, or both.
- Not cause erosion, aggradation, or scouring upstream or downstream of the crossing.
- Not cause water quality degradation.

SECTION 14 - TIER-SPECIFIC DESIGN CRITERIA

Stream crossings must be designed in accordance with the tier specific design criteria listed in Part Env-Wt 904.

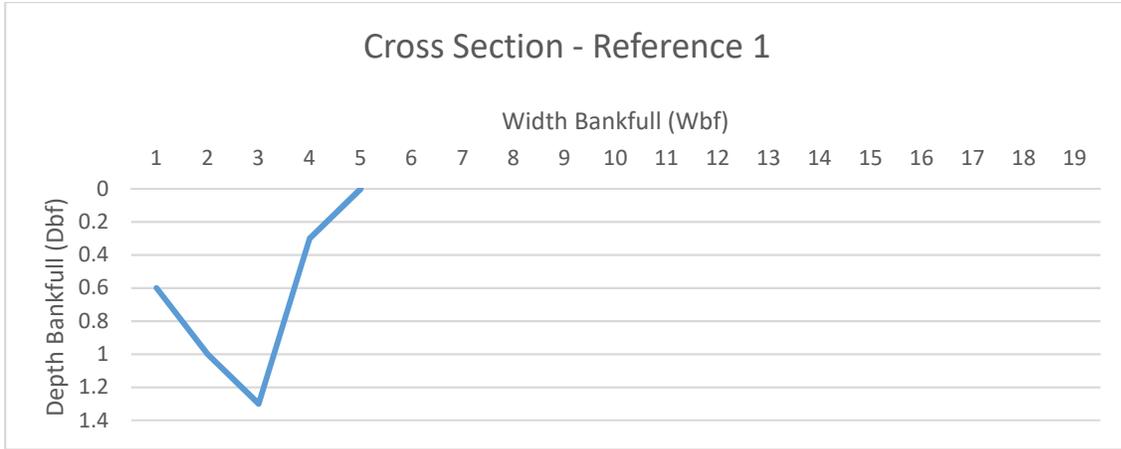
- The proposed project meets the tier specific design criteria listed in Part Env-Wt 904 and each requirement has been addressed in the plans and as part of the wetland application.

SECTION 15 - ALTERNATIVE DESIGN

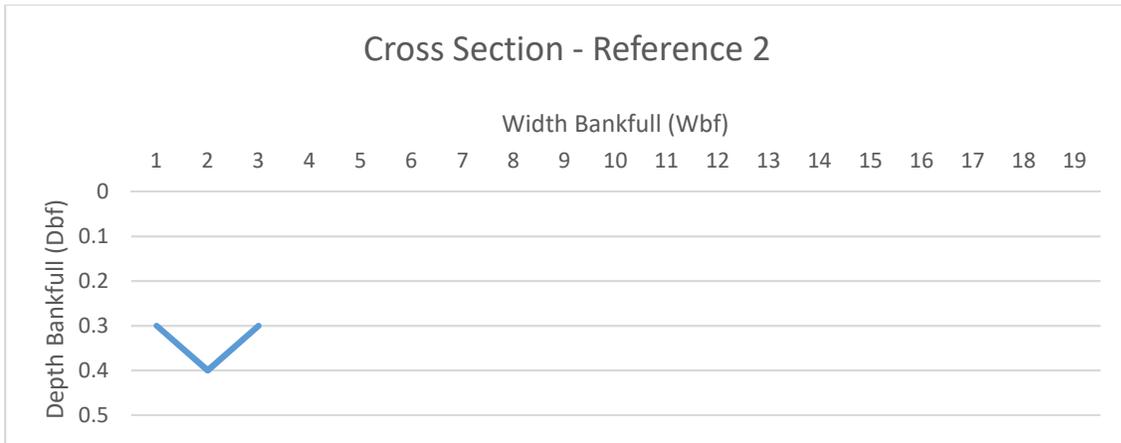
NOTE: If the proposed crossing does not meet all of the general design considerations, the tier specific design criteria, or the minimum entrenchment ratio for each given stream type listed in **Figure 3**, then an alternative design plan and associated requirements must be addressed pursuant to Env-Wt 904.10.

- I have submitted an alternative design and addressed each requirement listed in Env-Wt 904.10.

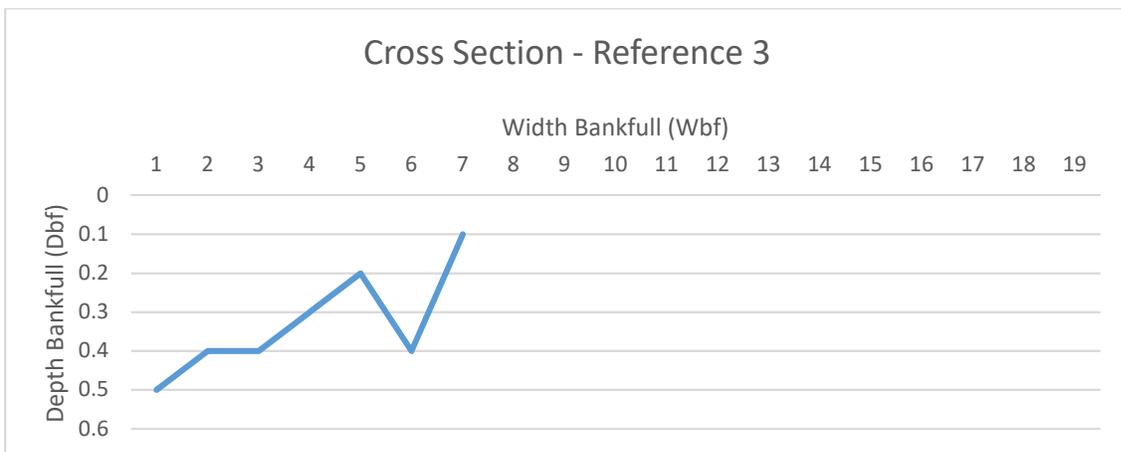
Madbury 43276, Stream crossing



Reference reach 1



Reference reach 2



Reference reach 3

Madbury 43276, Stream crossing



Reference reach 1-facing upstream



Reference reach 2-facing upstream

Madbury 43276, Stream crossing



Reference reach 3- facing upstream



Outlet

Madbury 43276, Stream crossing



Inlet

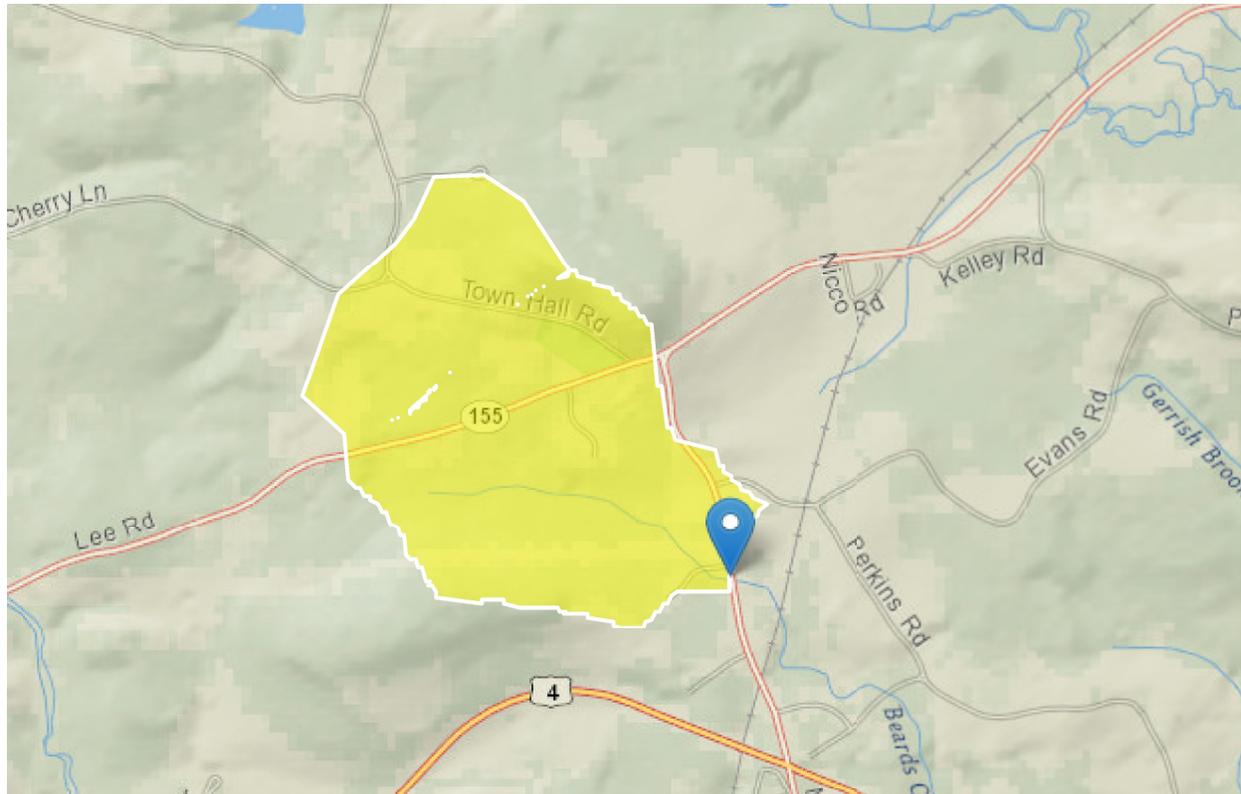
43276 StreamStats Report - Revised boundary to match LIDAR

Region ID: NH

Workspace ID: NH20210520181356931000

Clicked Point (Latitude, Longitude): 43.15894, -70.93333

Time: 2021-05-20 14:14:40 -0400



Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	0.58	square miles
APRAVPRE	Mean April Precipitation	4.144	inches
WETLAND	Percentage of Wetlands	5.6312	percent

Parameter Code	Parameter Description	Value	Unit
CSL10_85	Change in elevation divided by length between points 10 and 85 percent of distance along main channel to basin divide - main channel method not known	31.8	feet per mi
BSLDEM30M	Mean basin slope computed from 30 m DEM	6.155	percent
CENTROIDX	Basin centroid horizontal (x) location in state plane coordinates	1177498	meters
CENTROIDY	Basin centroid vertical (y) location in state plane units	242769.3	meters
CONIF	Percentage of land surface covered by coniferous forest	14.1528	percent
ELEVMAX	Maximum basin elevation	328.216	feet
LC11DEV	Percentage of developed (urban) land from NLCD 2011 classes 21-24	14.1	percent
LC11IMP	Average percentage of impervious area determined from NLCD 2011 impervious dataset	2	percent
MINTEMP_W	Mean winter minimum air temperature over basin surface area	16.68	degrees F
MIXFOR	Percentage of land area covered by mixed deciduous and coniferous forest	28.8372	percent
OUTLETX	Basin outlet horizontal (x) location in state plane coordinates	1179915	feet
OUTLETY	Basin outlet vertical (y) location in state plane coordinates	241005	feet
PREBC0103	Mean annual precipitation of basin centroid for January 1 to March 15 winter period	7.56	inches
PREBC_1112	Mean annual precipitation of basin centroid for November 1 to December 31 period	8.82	inches
PRECIPCENT	Mean Annual Precip at Basin Centroid	42.5	inches
PRECIPOUT	Mean annual precip at the stream outlet (based on annual PRISM precip data in inches from 1971-2000)	42.6	inches

Parameter Code	Parameter Description	Value	Unit
PREG_03_05	Mean precipitation at gaging station location for March 16 to May 31 spring period	9.2	inches
PREG_06_10	Mean precipitation at gaging station location for June to October summer period	16.9	inches
SNOFALL	Mean Annual Snowfall	58.228	inches
TEMP	Mean Annual Temperature	46.94	degrees F
TEMP_06_10	Basinwide average temperature for June to October summer period	62.662	degrees F

General Disclaimers

This watershed has been edited, computed flows and basin characteristics may not apply. For more information, submit a support request from the 'Help' button in the upper-right of the screen, attach a pdf of this report and request assistance from your local streamstats regional representative.

Peak-Flow Statistics Parameters [Peak Flow Statewide SIR2008 5206]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	0.58	square miles	0.7	1290
APRAVPRE	Mean April Precipitation	4.144	inches	2.79	6.23
WETLAND	Percent Wetlands	5.6312	percent	0	21.8
CSL10_85	Stream Slope 10 and 85 Method	31.8	feet per mi	5.43	543

Peak-Flow Statistics Disclaimers [Peak Flow Statewide SIR2008 5206]

One or more of the parameters is outside the suggested range. Estimates were extrapolated with unknown errors

Peak-Flow Statistics Flow Report [Peak Flow Statewide SIR2008 5206]

Statistic	Value	Unit
50-percent AEP flood	19.3	ft ³ /s
20-percent AEP flood	34.4	ft ³ /s
10-percent AEP flood	48	ft ³ /s
4-percent AEP flood	67.7	ft ³ /s
2-percent AEP flood	84.8	ft ³ /s
1-percent AEP flood	106	ft ³ /s
0.2-percent AEP flood	162	ft ³ /s

Peak-Flow Statistics Citations

Olson, S.A.,2009, Estimation of flood discharges at selected recurrence intervals for streams in New Hampshire: U.S.Geological Survey Scientific Investigations Report 2008-5206, 57 p. (<http://pubs.usgs.gov/sir/2008/5206/>)

USGS Data Disclaimer: Unless otherwise stated, all data, metadata and related materials are considered to satisfy the quality standards relative to the purpose for which the data were collected. Although these data and associated metadata have been reviewed for accuracy and completeness and approved for release by the U.S. Geological Survey (USGS), no warranty expressed or implied is made regarding the display or utility of the data for other purposes, nor on all computer systems, nor shall the act of distribution constitute any such warranty.

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Application Version: 4.5.3

StreamStats Services Version: 1.2.22

NSS Services Version: 2.1.2

Carucci, Christopher

From: Ryan Thompson <support@streamstats.freshdesk.com>
Sent: Monday, September 27, 2021 2:37 PM
To: Carucci, Christopher
Subject: Re: Revised watershed boundary for Beards Creek at Madbury Road, Madbury, NH

EXTERNAL: Do not open attachments or click on links unless you recognize and trust the sender.

Hi Christopher,

Editing a watershed using your local knowledge is definitely the correct thing to do. In looking at the StreamStats report you attached, I can see that the basin characteristics values have updated and are different than the values that occur with the automatically-delineation watershed at these coordinates. If you wish to confirm the peakflow computations, you can use the NSS Client, which utilizes the same regression equation database as the StreamStats Web Application. The NSS Client is at <https://streamstats.usgs.gov/nss/>. In the left panel, simply select the New Hampshire study area, the Peak-Flow statistics group, and the Regression Region for "Peak_Flow_Statewide_SIR2008_5206". Populate the boxes for explanatory variables with the values from your StreamStats report, and click the 'Compute' button. The resulting flow statistics should agree with the StreamStats output. In this specific case, the drainage area is somewhat smaller than the valid range for this region, but it is still reasonably close to the lower limit.

Ryan

Ticket: <https://streamstats.freshdesk.com/helpdesk/tickets/116989>

On Mon, 27 Sep at 1:43 PM , Christopher.a.carucci <christopher.a.carucci@dot.nh.gov> wrote:
The watershed area for this location was significantly less than the area as determined using LIDAR contours and field review information. The boundary in the attached report was edited so that it matches the LIDAR boundary. Please verify Peak Flow Statistics for the revised boundary.

Choose Study Area:

New_Hampshire

Limit by Statistic Group(s):

Select

Limit by Regression Region(s):

Select

Limit by Statistic(s):

Select

Calculate Statistic:

Compute

Go To:

Citations
Appendix

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Peak_Flow_Statewide_SIR2008_5206 Region

Drainage Area = 0.58 (mi²)

Mean April Precipitation = 4.144 (in)

Percent Wetlands = 5.6312 (%)

Stream Slope 10 and 85 Method = 31.8 (ft/mi)

[See, Standard Error of Estimate; SEP, Standard Error of Prediction; SE, Standard Error (other -- see report)]

Peak_Flow_Statewide_SIR2008_5206 Region

Description

Description	Value (ft ³ /s)
Maximum instantaneous flow that occurs with a 50% annual exceedance probability (PK50AEP)	19.3
Maximum instantaneous flow that occurs with a 20% annual exceedance probability (PK20AEP)	34.4
Maximum instantaneous flow that occurs with a 10% annual exceedance probability (PK10AEP)	48
Maximum instantaneous flow that occurs with a 4% annual exceedance probability (PK4AEP)	67.7
Maximum instantaneous flow that occurs with a 2% annual exceedance probability (PK2AEP)	84.8
Maximum instantaneous flow that occurs with a 1% annual exceedance probability (PK1AEP)	106
Maximum instantaneous flow that occurs with a 0.2% annual exceedance probability (PK0_2AEP)	162

Low-Flow Statistics

Download

Low_Flow_Statewide Region

Drainage Area = 0.58 (mi²)

Mean Annual Temperature = 46.94 (deg F)

Jun to Oct Gage Precipitation = 16.9 (in)

[See, Standard Error of Estimate; SEP, Standard Error of Prediction; SE, Standard Error (other -- see report)]

Low_Flow_Statewide Region

Description

Value
(ft³/s)

Memo

NH Natural Heritage Bureau NHB DataCheck Results Letter

Please note: portions of this document are confidential.
Maps and NHB record pages are confidential and should be redacted from public documents.

To: Kerry Ryan, NHDOT
7 Hazen Drive
Concord, NH 03301

From: Jessica Bouchard, NHNaturalHeritage Bureau
Date: 7/1/2021 (valid until 07/01/2022)

Re: Review by NH Natural Heritage Bureau
Permits: NHDES - Wetland Standard Dredge & Fill - Major, USA CE - General Permit, USCEQ - Federal: NEPA Review

NHB ID: NHB21-2175 Town: Madbury Location: Madbury Road
Description: The proposed project is a NHDOT culvert rehabilitation/replacement project. The existing structure is a 58" x 36" x 132' long arch pipe carrying Beard's Creek under Madbury Road. The structure is in poor condition with heavy rust and some perforations along the invert. Preferred treatment is rehabilitation, pending results of hydraulics analysis.
cc: Kim Turtle

As requested, I have searched our database for records of rare species and exemplary natural communities, with the following results.

Comments **NHB: No Comments At This Time**
F&G: Please let NHF&G know what the preferred treatment will be when available. Is there any other restoration plan for this stream, given the 90 degree turns and the excessive culvert length?

Vertebrate species	State ¹	Federal	Notes
Blanding's Turtle (<i>Emydoidea blandingii</i>)	E	--	Contact the NH Fish & Game Dept (see below).
Northern Black Racer (<i>Coluber constrictor constrictor</i>)	T	--	Contact the NH Fish & Game Dept (see below).
Spotted Turtle (<i>Clemmys guttata</i>)	T	--	Contact the NH Fish & Game Dept (see below).

¹Codes: "E" = Endangered, "T" = Threatened, "SC" = Special Concern, "--" = an exemplary natural community, or a rare species tracked by NH Natural Heritage that has not yet been added to the official state list. An asterisk (*) indicates that the most recent report for that occurrence was more than 20 years ago.

Contact for all animal reviews: Kim Turtle, NHF&G, (603) 271-6544.

A negative result (no record in our database) does not mean that a sensitive species is not present. Our data can only tell you of known occurrences, based on

Memo

NH Natural Heritage Bureau
NHB DataCheck Results Letter

Please note: portions of this document are confidential.

Maps and NHB record pages are confidential and should be redacted from public documents. Information gathered by qualified biologists and reported to our office. However, many areas have never been surveyed, or have only been surveyed for certain species. An on-site survey would provide better information on what species and communities are indeed present.

Department of Natural and Cultural Resources
Division of Forests and Lands
(603) 271-2214 fax: 271-6488

DNCR/NHB
172 Pembroke Rd.
Concord, NH 03301

Ryan, Kerry

From: Ryan, Kerry
Sent: Monday, September 27, 2021 11:51 AM
To: Tuttle, Kim
Cc: Magee, John; Doperalski, Melissa; Henderson, Carol
Subject: RE: NHB21-2175 Beards Creek Madbury Road Madbury

Kim,
There will be no perch after the slipling with the corrugated metal pipe liner.
Thank You,
Kerry

From: Tuttle, Kim <Kim.A.Tuttle@wildlife.nh.gov>
Sent: Monday, September 27, 2021 11:50 AM
To: Ryan, Kerry <Kerry.A.Ryan@dot.nh.gov>
Cc: Magee, John <john.a.magee@wildlife.nh.gov>; Doperalski, Melissa <Melissa.J.Doperalski@wildlife.nh.gov>; Henderson, Carol <Carol.B.Henderson@wildlife.nh.gov>
Subject: RE: NHB21-2175 Beards Creek Madbury Road Madbury

Hi Kerry,

As long as the pipe is not perched after the slipling with the corrugated metal pipe liner, I have no further concerns with this job. Please make sure the spotted and Blanding's turtle and northern black racer notes as well as their photos are on the plans.

Thanks,

Kim Tuttle
Wildlife Biologist
NH Fish and Game
11 Hazen Drive
Concord, NH 03301
603-271-6544

From: Ryan, Kerry <Kerry.A.Ryan@dot.nh.gov>
Sent: Monday, September 27, 2021 11:42 AM
To: Tuttle, Kim <Kim.A.Tuttle@wildlife.nh.gov>
Cc: Magee, John <john.a.magee@wildlife.nh.gov>; Doperalski, Melissa <Melissa.J.Doperalski@wildlife.nh.gov>; Henderson, Carol <Carol.B.Henderson@wildlife.nh.gov>
Subject: RE: NHB21-2175 Beards Creek Madbury Road Madbury

Hi Kim,

This project is moving through the design phase and an alternative has now been chosen. The existing pipe (you are correct, I had a typo in my original email, the pipe is 132' long) will be sliplined with a corrugated metal pipe liner. This option would have the least effect on velocity and would maintain the existing corrugated interior condition for AOP and fish passage. The proposed design will remove a portion of the damaged inlet end, shortening the culvert by about 7'

and creating a more hydraulically efficient headwall at the inlet. The area of pipe removed will be replaced with simulated streambed material for the channel bottom and vegetated side slopes.

As stated in your below email, the contract will include the turtle flyer and commitment as well as the need to use wildlife friendly erosion control. Please let me know if you have any additional concerns or comments.

Thank You,

Kerry

From: Tuttle, Kim <Kim.A.Tuttle@wildlife.nh.gov>
Sent: Thursday, July 08, 2021 9:46 AM
To: Ryan, Kerry <Kerry.A.Ryan@dot.nh.gov>
Cc: Magee, John <john.a.magee@wildlife.nh.gov>; Doperalski, Melissa <Melissa.J.Doperalski@wildlife.nh.gov>; Henderson, Carol <Carol.B.Henderson@wildlife.nh.gov>
Subject: NHB21-2175 Beards Creek Madbury Road Madbury

Hi Kerry,

The NHB states that the existing structure is a 58" x 36" x 132' long CMP so I am assuming that it is a typo below.

I do not have a strong opinion on the two rehabilitation options being considered as I do not really know what would provide the most surface friction and corrugation. If I had to choose one, I probably would go with #1. Perhaps John Magee or Melissa Doperalski could provide an opinion on which alternative they feel provides the most traction and velocity breaks for aquatic species attempting to move upstream. The extremely long length (and darkness) of this culvert may present a psychological barrier for turtles to enter the culvert.

Avoid the use of welded plastic or 'biodegradable plastic' netting or thread (e.g. polypropylene) in erosion control matting, if needed. There are numerous documented cases of snakes including northern black racer and other wildlife being trapped and killed in erosion control matting with synthetic netting and thread. The use of erosion control berm, Filtrexx Degradable Woven Silt Sock, or several 'wildlife friendly' options such as woven organic material (e.g. coco or jute matting such as North American Green SC150BN or equivalent) are readily available.

Please have the turtle poster distributed to the construction personnel and inform them of the potential to encounter protected turtles from April through November. Female Blanding's and spotted turtles will lay eggs in exposed mineral soils with good sun exposure during turtle nesting season from the end of May until the beginning of July, peaking in mid- June, and may lay eggs in newly disturbed construction site soils. Most newly hatched turtles will emerge from their nests from August through October. Blanding's is a highly terrestrial turtle spending much time in uplands travelling between vernal pools and wetlands to feed.

The following notes should be prominently added to the plans along with a photo of Blanding', spotted turtle, and northern black racer that may be copied from the attached flyers:

IF SPOTTED OR BLANDING'S TURTLES ARE FOUND LAYING EGGS IN A WORK AREA, PLEASE CONTACT MELISSA DOPERALSKI (603-479-1129 cell) or JOSH MEGYESY (cell 978-578-0802) FOR FURTHER INSTRUCTIONS.

All observations of northern black racer snakes encountered from the end of September through the month of April must be IMMEDIATELY REPORTED to the NHFG Department (Melissa Doperalski 603-479-1129 (cell) or Brendan Clifford 603-944-0885 (cell)) as this indicates a potential hibernaculum in the area. Please attempt to photograph this species if possible.

Thanks,

Kim Tuttle
Wildlife Biologist
NH Fish and Game
11 Hazen Drive
Concord, NH 03301
603-271-6544

From: Ryan, Kerry <Kerry.A.Ryan@dot.nh.gov>
Sent: Thursday, July 8, 2021 6:03 AM
To: Tuttle, Kim <Kim.A.Tuttle@wildlife.nh.gov>
Subject: FW: NHB review: NHB21-2175

Hi Kim,

The NH Department of Transportation (DOT) is planning a culvert rehabilitation project, located on Madbury Road, approximately 0.5 miles north of US Route 4 in the Town of Madbury. Project limits may extend up to 500' north and south of the culvert. The existing culvert is an elliptical 58" x 36" x 12" corrugated metal pipe (cmp) carrying Beards Creek under Madbury Road. The existing cmp arch pipe was originally constructed in 1979 and is in poor condition with heavy rust and some perforations along the invert.

An alternative has not yet been chosen, but two rehabilitation options are being considered:

1. A cured in place liner which is smooth fiberglass but will conform to the existing corrugations to some extent.
2. A new fiber reinforced plastic liner that can be made to custom shape. This product is smooth but a 'no slip' textured bottom is available.

The proposed work includes shortening the culvert about 8' on the inlet end and construct a headwall to improve hydraulic capacity.

Re-aligning the stream on the inlet side would involve significant tree removal and wetland impacts that are beyond the scope of this project.

The attached NHB report identified Blanding's turtle, northern black racer, and spotted turtle.

Please let me know if you have any concerns with the options being considered or if there is any additional information I can provide.

Thank You,

Kerry

From: DNCR: NHB Review <nhbreview@dncr.nh.gov>
Sent: Friday, July 02, 2021 7:01 PM
To: Ryan, Kerry <Kerry.A.Ryan@dot.nh.gov>
Cc: Tuttle, Kim <Kim.A.Tuttle@wildlife.nh.gov>
Subject: NHB review: NHB21-2175

Attached, please find the review we have completed. If your review memo includes potential impacts to plants or natural communities please contact me for further information. If your project had potential impacts to wildlife, please contact NH Fish and Game at the phone number listed on the review.

Best,
Jessica

Jessica Bouchard
Environmental Reviewer / Ecological Information Specialist

NH Natural Heritage Bureau
DNCR - Forests & Lands
172 Pembroke Rd
Concord, NH 03301
603-271-2834

Ryan, Kerry

From: Dionne, Michael
Sent: Monday, September 20, 2021 12:00 PM
To: Ryan, Kerry
Cc: Magee, John; Sullivan, Kevin; Carpenter, Matthew
Subject: Re: NHB21-2175 Beards Creek Madbury Road Madbury

Hi Kerry,

This site is not winter flounder habitat, that's way downstream where Beard's Creek meets the tidal portion of the Oyster River. There is also no chance of rainbow smelt here and probably no river herring either. However, there are likely to be American eels present at this location.

Mike Dionne
Marine Biologist

NH Fish and Game Department
225 Main St. Durham, NH 03824
(603) 868-1095, michael.dionne@wildlife.nh.gov

NH Fish and Game...*connecting you to life outdoors*
www.wildnh.com, www.facebook.com/nhfishandgame

Did you know? New Hampshire Fish and Game has been conserving New Hampshire's wildlife and their habitats since 1865.

From: Magee, John <john.a.magee@wildlife.nh.gov>
Sent: Monday, September 20, 2021 11:31 AM
To: Sullivan, Kevin <Kevin.M.Sullivan@wildlife.nh.gov>; Dionne, Michael <Michael.A.Dionne@wildlife.nh.gov>; Carpenter, Matthew <mathew.a.carpenter@wildlife.nh.gov>
Cc: Ryan, Kerry <Kerry.A.Ryan@dot.nh.gov>
Subject: FW: NHB21-2175 Beards Creek Madbury Road Madbury

Hi Kevin, Mike and Matt: do you have any information on this? Please see Kerry's email below and please reply to her and cc me if you do or do not have information for her for this site.

Thank you,

John

John Magee, M.S., Certified Fisheries Professional
Fisheries Habitat Research and Management Programs Coordinator
New Hampshire Fish and Game Department
11 Hazen Drive, Concord, NH 03301
Phone 603-271-2744
Fax 603-271-5829

Did you know? New Hampshire Fish and Game protects, conserves and manages more than 500 species of wildlife, including 63 mammals, 18 reptiles, 22 amphibians, 313 birds and 122 kinds of fish as well as thousands of invertebrates!

From: Ryan, Kerry <Kerry.A.Ryan@dot.nh.gov>
Sent: Monday, September 20, 2021 11:06 AM
To: Magee, John <john.a.magee@wildlife.nh.gov>
Subject: RE: NHB21-2175 Beards Creek Madbury Road Madbury

Hi Jon,

I'm in the process of coordinating with NOAA for this project because Beard's Creek is designated as EFH for winter flounder. As a part of the coordination, I'm looking for information as to if this area is supportive of diadromous resources. NOAA has commented, 'It is unlikely that juvenile winter flounder habitat is found at this location. However if alewife, rainbow smelt and eel are present- a TOY restriction from March 15 to June 30 may be warranted to allow for AOP during migration.'

In a previous email you mentioned NHFG didn't have any fish data for this location, but any comments you have regarding the potential for diadromous species would be very helpful.

Attached is a location map, aerial view, and photos. Please let me know if there is any additional information I can provide.

Thank You,

Kerry

From: Magee, John <john.a.magee@wildlife.nh.gov>
Sent: Thursday, July 08, 2021 2:42 PM
To: Tuttle, Kim <Kim.A.Tuttle@wildlife.nh.gov>; Ryan, Kerry <Kerry.A.Ryan@dot.nh.gov>
Cc: Doperalski, Melissa <Melissa.J.Doperalski@wildlife.nh.gov>; Henderson, Carol <Carol.B.Henderson@wildlife.nh.gov>
Subject: RE: NHB21-2175 Beards Creek Madbury Road Madbury

This is the paper (but not the full paper) in which they used cameras (https://www.researchgate.net/publication/319546924_Swimming_behaviour_and_ascent_paths_of_brook_trout_in_a_corrugated_culvert)

From: Magee, John
Sent: Thursday, July 8, 2021 2:40 PM
To: Tuttle, Kim <Kim.A.Tuttle@wildlife.nh.gov>; Ryan, Kerry <Kerry.A.Ryan@dot.nh.gov>
Cc: Doperalski, Melissa <Melissa.J.Doperalski@wildlife.nh.gov>; Henderson, Carol <Carol.B.Henderson@wildlife.nh.gov>
Subject: RE: NHB21-2175 Beards Creek Madbury Road Madbury

We have no fish data for this stream. Fish definitely use the corrugations to move upstream through culverts as each corrugation provides a reduction in velocity right at each corrugation. There is some interesting research on this from Quebec where they showed, using cameras, that fish will sit with their nose right at a corrugation and then burst upstream for a few feet or more and then rest again. Most of that resting is at the edge of the water, which makes sense because the highest velocities are in the center of the pipe.

https://www.researchgate.net/publication/267898387_Culvert_Hydraulics_and_Passage_Performance_of_Brook_Trou t_Understanding_the_Key_to_Success

John

From: Tuttle, Kim <Kim.A.Tuttle@wildlife.nh.gov>

Sent: Thursday, July 8, 2021 9:46 AM

To: Ryan, Kerry <Kerry.A.Ryan@dot.nh.gov>

Cc: Magee, John <john.a.magee@wildlife.nh.gov>; Doperalski, Melissa <Melissa.J.Doperalski@wildlife.nh.gov>;

Henderson, Carol <Carol.B.Henderson@wildlife.nh.gov>

Subject: NHB21-2175 Beards Creek Madbury Road Madbury

Hi Kerry,

The NHB states that the existing structure is a 58" x 36" x 132' long CMP so I am assuming that it is a typo below.

I do not have a strong opinion on the two rehabilitation options being considered as I do not really know what would provide the most surface friction and corrugation. If I had to choose one, I probably would go with #1. Perhaps John Magee or Melissa Doperalski could provide an opinion on which alternative they feel provides the most traction and velocity breaks for aquatic species attempting to move upstream. The extremely long length (and darkness) of this culvert may present a psychological barrier for turtles to enter the culvert.

Avoid the use of welded plastic or 'biodegradable plastic' netting or thread (e.g. polypropylene) in erosion control matting, if needed. There are numerous documented cases of snakes including northern black racer and other wildlife being trapped and killed in erosion control matting with synthetic netting and thread. The use of erosion control berm, Filtrexx Degradable Woven Silt Sock, or several 'wildlife friendly' options such as woven organic material (e.g. coco or jute matting such as North American Green SC150BN or equivalent) are readily available.

Please have the turtle poster distributed to the construction personnel and inform them of the potential to encounter protected turtles from April through November. Female Blanding's and spotted turtles will lay eggs in exposed mineral soils with good sun exposure during turtle nesting season from the end of May until the beginning of July, peaking in mid- June, and may lay eggs in newly disturbed construction site soils. Most newly hatched turtles will emerge from their nests from August through October. Blanding's is a highly terrestrial turtle spending much time in uplands travelling between vernal pools and wetlands to feed.

The following notes should be prominently added to the plans along with a photo of Blanding', spotted turtle, and northern black racer that may be copied from the attached flyers:

IF SPOTTED OR BLANDING'S TURTLES ARE FOUND LAYING EGGS IN A WORK AREA, PLEASE CONTACT MELISSA DOPERALSKI (603-479-1129 cell) or JOSH MEGYESY (cell 978-578-0802) FOR FURTHER INSTRUCTIONS.

All observations of northern black racer snakes encountered from the end of September through the month of April must be IMMEDIATELY REPORTED to the NHFG Department (Melissa Doperalski 603-479-1129 (cell) or Brendan Clifford 603-944-0885 (cell)) as this indicates a potential hibernaculum in the area. Please attempt to photograph this species if possible.

Thanks,

Kim Tuttle
Wildlife Biologist
NH Fish and Game
11 Hazen Drive

Concord, NH 03301
603-271-6544

From: Ryan, Kerry <Kerry.A.Ryan@dot.nh.gov>
Sent: Thursday, July 8, 2021 6:03 AM
To: Tuttle, Kim <Kim.A.Tuttle@wildlife.nh.gov>
Subject: FW: NHB review: NHB21-2175

Hi Kim,

The NH Department of Transportation (DOT) is planning a culvert rehabilitation project, located on Madbury Road, approximately 0.5 miles north of US Route 4 in the Town of Madbury. Project limits may extend up to 500' north and south of the culvert. The existing culvert is an elliptical 58" x 36" x 12" corrugated metal pipe (cmp) carrying Beards Creek under Madbury Road. The existing cmp arch pipe was originally constructed in 1979 and is in poor condition with heavy rust and some perforations along the invert.

An alternative has not yet been chosen, but two rehabilitation options are being considered:

1. A cured in place liner which is smooth fiberglass but will conform to the existing corrugations to some extent.
2. A new fiber reinforced plastic liner that can be made to custom shape. This product is smooth but a 'no slip' textured bottom is available.

The proposed work includes shortening the culvert about 8' on the inlet end and construct a headwall to improve hydraulic capacity.

Re-aligning the stream on the inlet side would involve significant tree removal and wetland impacts that are beyond the scope of this project.

The attached NHB report identified Blanding's turtle, northern black racer, and spotted turtle.

Please let me know if you have any concerns with the options being considered or if there is any additional information I can provide.

Thank You,

Kerry

From: DNCR: NHB Review <nhbreview@dncr.nh.gov>
Sent: Friday, July 02, 2021 7:01 PM
To: Ryan, Kerry <Kerry.A.Ryan@dot.nh.gov>
Cc: Tuttle, Kim <Kim.A.Tuttle@wildlife.nh.gov>
Subject: NHB review: NHB21-2175

Attached, please find the review we have completed. If your review memo includes potential impacts to plants or natural communities please contact me for further information. If your project had potential impacts to wildlife, please contact NH Fish and Game at the phone number listed on the review.

Best,
Jessica

Jessica Bouchard
Environmental Reviewer / Ecological Information Specialist
NH Natural Heritage Bureau
DNCR - Forests & Lands
172 Pembroke Rd
Concord, NH 03301
603-271-2834

Ryan, Kerry

From: Kaitlyn Shaw - NOAA Federal <kaitlyn.shaw@noaa.gov>
Sent: Tuesday, September 21, 2021 9:11 AM
To: Ryan, Kerry
Cc: Jamie.sikora@dot.gov
Subject: Re: NHDOT Project: Madbury 43276

Follow Up Flag: Follow up
Flag Status: Flagged

EXTERNAL: Do not open attachments or click on links unless you recognize and trust the sender.

Hi Kerry,

Thank you for looking into this and providing the attached information. We typically do not provide TOY restrictions for systems with eel only. In the future for freshwater projects that may contain diadromous NOAA trust resources, it is beneficial to provide this information during an early coordination check-in email, and then I can let you know whether we need the worksheet. I do not have CR's to provide for this project.

Best,

Kaitlyn Shaw

Marine Resources Management Specialist
Habitat and Ecosystem Services Division
NOAA/ National Marine Fisheries Service
Gloucester, MA
Office: 978-282-8457
Pronouns: she/her/hers
kaitlyn.shaw@noaa.gov
www.nmfs.noaa.gov

On Mon, Sep 20, 2021 at 2:11 PM Ryan, Kerry <Kerry.A.Ryan@dot.nh.gov> wrote:

Hi Kaitlyn,

I have reached out to NHFG to see if they had any information regarding diadromous resources in the area of the Madbury project and I have received the below response.

Should we move forward with the March 15th to June 30th time restriction?

Thank you,

Kerry Ryan

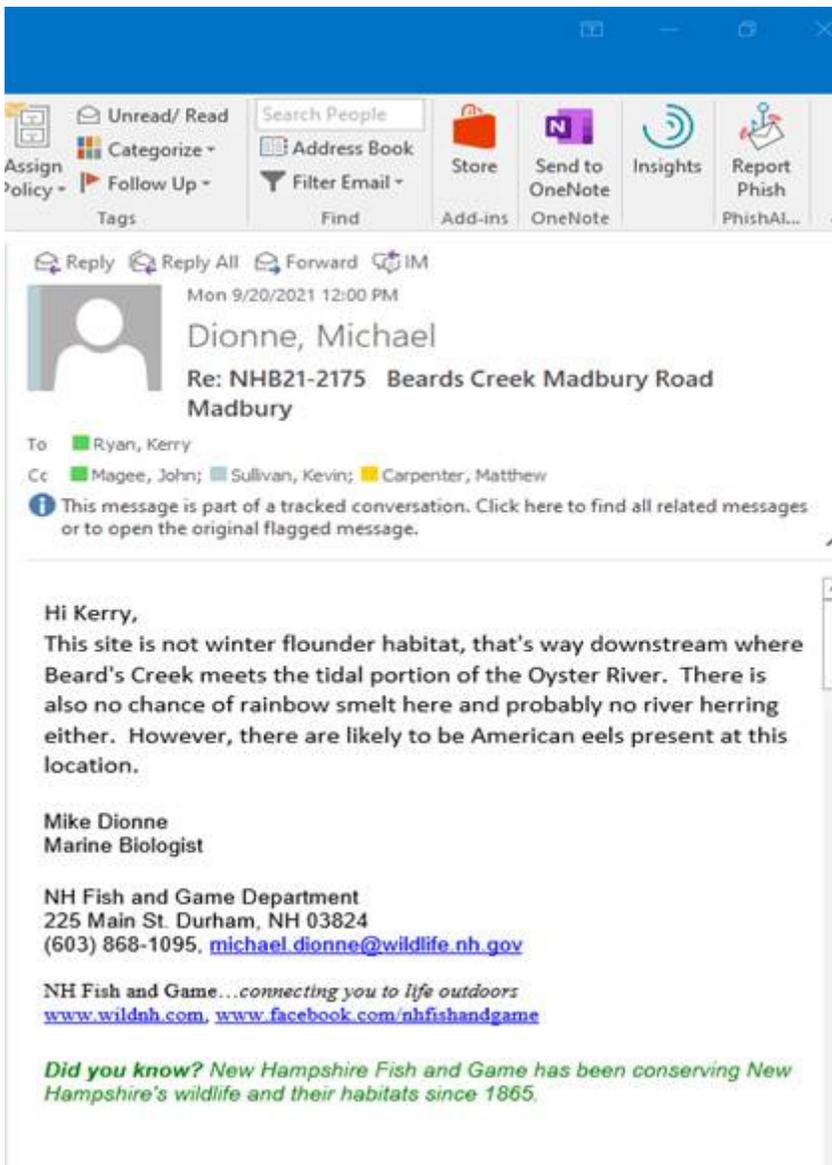
Environmental Manager

NH Department of Transportation

Bureau of Environment

7 Hazen Drive, Concord, NH 03302

Ph: 603-271-3717



The screenshot shows the Outlook interface for an email. The top ribbon includes options like 'Unread/Read', 'Assign Policy', 'Follow Up', 'Tags', 'Search People', 'Address Book', 'Filter Email', 'Find', 'Store', 'Add-ins', 'Send to OneNote', 'OneNote', 'Insights', 'Report Phish', and 'PhishAl...'. The email header shows it was received on Monday, 9/20/2021 at 12:00 PM from Dionne, Michael. The subject is 'Re: NHB21-2175 Beards Creek Madbury Road Madbury'. The recipients listed are Ryan, Kerry; Magee, John; Sullivan, Kevin; and Carpenter, Matthew. A message icon indicates it's part of a tracked conversation. The main body of the email contains the following text:

Hi Kerry,
This site is not winter flounder habitat, that's way downstream where Beard's Creek meets the tidal portion of the Oyster River. There is also no chance of rainbow smelt here and probably no river herring either. However, there are likely to be American eels present at this location.

Mike Dionne
Marine Biologist

NH Fish and Game Department
225 Main St. Durham, NH 03824
(603) 868-1095, michael.dionne@wildlife.nh.gov

NH Fish and Game...connecting you to life outdoors
www.wildnh.com, www.facebook.com/nhfishandgame

Did you know? New Hampshire Fish and Game has been conserving New Hampshire's wildlife and their habitats since 1865.

From: Kaitlyn Shaw - NOAA Federal <kaitlyn.shaw@noaa.gov>
Sent: Monday, September 20, 2021 10:21 AM
To: Ryan, Kerry <Kerry.A.Ryan@dot.nh.gov>
Subject: Re: NHDOT Project: Madbury 43276

EXTERNAL: Do not open attachments or click on links unless you recognize and trust the sender.

Hi Kerry,

Thank you for this information. Do you know if this area is supportive of diadromous resources? It is unlikely that juvenile winter flounder habitat is found at this location. However if alewife, rainbow smelt and eel are present- a TOY restriction from March 15 to June 30 may be warranted to allow for AOP during migration.

Best,

Kaitlyn Shaw

Marine Resources Management Specialist

Habitat and Ecosystem Services Division

NOAA/ National Marine Fisheries Service

Gloucester, MA

Office: 978-282-8457

Pronouns: she/her/hers

kaitlyn.shaw@noaa.gov

www.nmfs.noaa.gov

On Mon, Sep 20, 2021 at 9:09 AM Ryan, Kerry <Kerry.A.Ryan@dot.nh.gov> wrote:

Good Morning Kaitlyn,

The proposed subject project is a federally funded NHDOT culvert rehabilitation project. The existing culvert carries Madbury Road over Beards Creek in Madbury, NH. The existing culvert is a 58" wide x 36" high x 131' long corrugated metal arch pipe. The pipe is in poor condition and in need of repair. The purpose of the project is to rehabilitate the existing culvert and prevent a failure at the crossing. The proposed treatment is rehabilitation by sliplining with a corrugated metal pipe. Of the alternatives considered, this option was chosen due to its ability, in comparison to the existing culvert, to maintain capacity, AOP and have the least effect on velocity. There are no permanent wetland impacts associated with this work.

A review of the EFH Mapper identified this location as EFH for winter flounder (juvenile). Attached is a location map, aerial view, EFH worksheet, draft wetland plan, and photos.

Please let me know if you have any concerns with this project or if there is any additional information I can provide.

Thank You,

Kerry Ryan

Environmental Manager

NH Department of Transportation

Bureau of Environment

7 Hazen Drive, Concord, NH 03302

Ph: 603-271-3717



United States Department of the Interior



FISH AND WILDLIFE SERVICE
New England Ecological Services Field Office
70 Commercial Street, Suite 300
Concord, NH 03301-5094
Phone: (603) 223-2541 Fax: (603) 223-0104
<http://www.fws.gov/newengland>

In Reply Refer To:
Consultation Code: 05E1NE00-2021-SLI-2281
Event Code: 05E1NE00-2022-E-01485
Project Name: Madbury 43276

November 10, 2021

Subject: Updated list of threatened and endangered species that may occur in your proposed project location or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*).

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the ECOS-IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the ECOS-IPaC system by completing the same process used to receive the enclosed list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 *et seq.*), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)(c)). For projects other than major construction activities, the Service suggests that a biological evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at:

<http://www.fws.gov/endangered/esa-library/pdf/TOC-GLOS.PDF>

Please be aware that bald and golden eagles are protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668 *et seq.*), and projects affecting these species may require development of an eagle conservation plan (http://www.fws.gov/windenergy/eagle_guidance.html). Additionally, wind energy projects should follow the wind energy guidelines (<http://www.fws.gov/windenergy/>) for minimizing impacts to migratory birds and bats.

Guidance for minimizing impacts to migratory birds for projects including communications towers (e.g., cellular, digital television, radio, and emergency broadcast) can be found at:

<http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/towers.htm>;

<http://www.towerkill.com>; and

[http://](http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/comtow.html)

www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/comtow.html.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Tracking Number in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment(s):

- Official Species List

Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

New England Ecological Services Field Office

70 Commercial Street, Suite 300

Concord, NH 03301-5094

(603) 223-2541

Project Summary

Consultation Code: 05E1NE00-2021-SLI-2281

Event Code: Some(05E1NE00-2022-E-01485)

Project Name: Madbury 43276

Project Type:

Project Description: The proposed project is a culvert rehabilitation project located on Madbury Road in Madbury, approximately 0.55 miles north of US Route 4. The existing culvert is a 58" x 36" x 132' long cmp arch pipe carrying Beards Creek under Madbury Rd. The project limits may extend up to 500' north and south of the culvert. The existing pipe was originally constructed in 1979 and is in poor condition with heavy rust and some perforations along the invert. The proposed project will slip line the existing culvert with a corrugated metal liner. A portion of the damaged inlet end will be removed, shortening the culvert approximately 7', and a more hydraulically efficient headwall will be installed at the inlet. Minimal tree clearing will take place at the outlet. All proposed work is within the State right-of-way.

Project Location:

Approximate location of the project can be viewed in Google Maps: <https://www.google.com/maps/@43.1589754,-70.93324044975407,14z>



Counties: Strafford County, New Hampshire

Endangered Species Act Species

There is a total of 2 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries¹, as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

-
1. [NOAA Fisheries](#), also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

Mammals

NAME	STATUS
Northern Long-eared Bat <i>Myotis septentrionalis</i> No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/9045	Threatened

Insects

NAME	STATUS
Monarch Butterfly <i>Danaus plexippus</i> No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/9743	Candidate

Critical habitats

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.



United States Department of the Interior



FISH AND WILDLIFE SERVICE

New England Field Office
70 Commercial Street, Suite 300
Concord, NH 03301-5087
<http://www.fws.gov/newengland>

October 4, 2021

Kerry Ryan
Bureau of Environment
NH Department of Transportation
7 Hazen Drive, P.O. Box 483
Concord, New Hampshire 03302-0483

Re: NH DOT Project 43276 Madbury Culvert Rehabilitation
TAILS: 05E1NE00-2021-F-2281

Dear Kerry Ryan:

The U.S. Fish and Wildlife Service (Service) is responding to your September 22, 2021 electronic transmission, requesting we verify that the New Hampshire Department of Transportation (NHDOT) proposed Beards Creek culvert project for Madbury Road (Project) may rely on the revised February 5, 2018, Programmatic Biological Opinion (BO) for federally funded or approved transportation projects that may affect the northern long-eared bat (*Myotis septentrionalis*) (NLEB). This letter provides the Service's response as to whether the Federal Highway Administration may rely on the BO to comply with section 7(a)(2) of the Endangered Species Act of 1973 (ESA) (87 Stat. 884, as amended; U.S.C. 1531 *et seq.*) for the Project's effects to the NLEB.

The NHDOT, as the non-Federal agency representative for the Federal Transportation Agency, has determined that the Project may affect, and is likely to adversely affect the NLEB. The Project includes slip lining the existing culvert and installation of a headwall. Less than 0.1 acre of tree clearing will occur in the bat active season.

NHDOT also determined the Project may rely on the programmatic BO to comply with section 7(a)(2) of the ESA, because the Project meets the conditions outlined in the BO and all tree clearing related to the proposed work will occur farther than 0.25 mile from documented roosts and farther than 0.5 mile from any known hibernacula. The Service reviewed the LAA Consistency Letter and concurs with NHDOT's determination. This concurrence concludes your ESA section 7 responsibilities relative to this species for this Project, subject to the Reinitiation Notice below.

Conclusion

The Service has reviewed the effects of the proposed Project, which include the NHDOT's commitment to implement the impact avoidance, minimization, and compensation measures as indicated on the LAA Consistency Letter. We confirm that the proposed Project's effects are consistent with those analyzed in the BO. The Service has determined that the Project is consistent with the BO's conservation measures, and the scope of the program analyzed in the BO is not likely to jeopardize the continued existence of the NLEB. In coordination with your agency, the Federal Highway Administration, and the other sponsoring Federal Transportation Agencies, the Service will reevaluate this conclusion annually in light of any new pertinent information under the adaptive management provisions of the BO.

Incidental Take of the Northern Long-eared Bat

The Service anticipates that tree removal associated with the proposed Project will cause incidental take of the NLEB. However, the Project is consistent with the BO, and such projects will not cause take of NLEBs that is prohibited under the final 4(d) rule for this species (50 CFR §17.40(o)). Therefore, this taking does not require exemption from the Service.

Reporting Dead or Injured Bats

The NHDOT, the Federal Highway Administration, its State/local cooperators, and any contractors must take care when handling dead or injured NLEBs that are found at the project site, in order to preserve biological material in the best possible condition and to protect the handler from exposure to diseases, such as rabies. Project personnel are responsible for ensuring that any evidence about determining the cause of death or injury is not unnecessarily disturbed. Reporting the discovery of dead or injured listed species is required in all cases to enable the Service to determine whether the level of incidental take exempted by this BO is exceeded, and to ensure that the terms and conditions are appropriate and effective. Parties finding a dead, injured, or sick specimen of any endangered or threatened species must promptly notify the Service's New England Field Office.

Reinitiation Notice

This letter concludes consultation for the proposed Project, which qualifies for inclusion in the BO issued to the Federal Transportation Agencies. To maintain this inclusion, a reinitiation of this project-level consultation is required where the Federal Highway Administration's discretionary involvement or control over the Project has been retained (or is authorized by law) and if:

1. new information reveals that the Project may affect listed species or critical habitat in a manner or to an extent not considered in the BO;
2. the Project is subsequently modified in a manner that causes an effect to listed species or designated critical habitat not considered in the BO; or
3. a new species is listed or critical habitat designated that the Project may affect.

In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease, pending reinitiation.

Kerry Ryan
October 4, 2021

3

We appreciate your continued efforts to ensure that this Project is fully consistent with all applicable provisions of the BO. If you have any questions regarding our response, or if you need additional information, please contact Susi von Oettingen of this office at 603-748-8357.

Sincerely yours,

Audrey Mayer
Supervisor
New England Field Office

cc: Reading file
Kerry Ryan/NHDOT via email Kerry.A.Ryan@dot.nh.gov
ES: SvonOettingen:jd:10-4-21:603-748-8357

Section 106 Programmatic Agreement – Cultural Resources Review Effect Finding

Appendix B Certification – Activities with Minimal Potential to Cause Effects

Date Reviewed: 9/22/2021
(Desktop or Field Review Date)

Project Name: Kerry Ryan

State Number: 43276

FHWA Number: X-A005(068)

Environmental Contact: Kerry Ryan

DOT

Email Address: Kerry.ryan@dot.nh.gov

Project Kirk Mudgett

Manager:

Project Description: The proposed project is a culvert rehabilitation project which proposes to rehabilitate an existing elliptical 58" x 36" x 132' corrugated metal arch pipe (cmp) carrying Beard's Creek under Madbury Road. The culvert is located approximately 0.55 miles north of the US Route 4 intersection. The existing cmp was originally constructed in 1979 and is in poor condition with heavy rust and some perforations along the invert. The proposed design will remove a portion of the damaged inlet end, shorten the culvert by about 7', install a more hydraulically efficient headwall at the inlet, and place rip rap at the inlet for stabilization. All proposed work is within the State right-of-way.

Please select the applicable activity/activities:

Highway and Roadway Improvements	
<input checked="" type="checkbox"/>	1. Modernization and general highway maintenance <u>that may require additional highway right-of-way or easement</u> , including: h. removal of trees, as part of roadway improvements Choose an item.
<input type="checkbox"/>	2. Installation of rumble strips or rumble stripes
<input type="checkbox"/>	3. Installation or replacement of pole-mounted signs
<input type="checkbox"/>	4. Guardrail replacement, provided any extension does not connect to a bridge older than 50 years old (unless it does already), and there is no change in access associated with the extension
Bridge and Culvert Improvements	
<input type="checkbox"/>	5. Culvert replacement (excluding stone box culverts), when the culvert is less than 60" in diameter and excavation for replacement is limited to previously disturbed areas
<input type="checkbox"/>	6. Bridge deck preservation and replacement, as long as no character defining features are impacted
<input checked="" type="checkbox"/>	7. Non-historic bridge and culvert maintenance, renovation, or total replacement, <u>that may require minor additional right-of-way or easement</u> , including: Choose an item. a. replacement or maintenance of non-historic bridges
<input type="checkbox"/>	8. Historic bridge maintenance activities within the limits of existing right-of-way, including: l. Installation of culvert inverts or slip-lining Choose an item.
<input checked="" type="checkbox"/>	9. Stream and/or slope stabilization and restoration activities (including removal of debris or sediment obstructing the natural waterway, or any non-invasive action to restore natural conditions)
Bicycle and Pedestrian Improvements	
<input type="checkbox"/>	10. Construction of pedestrian walkways, sidewalks, sidewalk tip-downs, small passenger shelters, and alterations to facilities or vehicles in order to make them accessible for elderly and handicapped persons
<input type="checkbox"/>	11. Installation of bicycle racks
<input type="checkbox"/>	12. Recreational trail construction
<input type="checkbox"/>	13. Recreational trail maintenance when done on existing alignment

Section 106 Programmatic Agreement – Cultural Resources Review Effect Finding

Appendix B Certification – Activities with Minimal Potential to Cause Effects

<input type="checkbox"/>	14. Construction of bicycle lanes and shared use paths and facilities within the existing right-of-way
Railroad Improvements	
<input type="checkbox"/>	15. Modernization, maintenance, and safety improvements of railroad facilities within the existing railroad or highway right-of-way, provided no historic railroad features are impacted , including, but not limited to: Choose an item. Choose an item.
<input type="checkbox"/>	16. In-kind replacement of modern railroad features (i.e. those features that are less than 50 years old)
<input type="checkbox"/>	17. Modernization/modification of railroad/roadway crossings provided that all work is undertaken within the limits of the roadway structure (edge of roadway fill to edge of roadway fill) and no associated character defining features are impacted
Other Improvements	
<input type="checkbox"/>	18. Installation of Intelligent Transportation Systems
<input type="checkbox"/>	19. Acquisition or renewal of scenic, conservation, habitat, or other land preservation easements where no construction will occur
<input type="checkbox"/>	20. Rehabilitation or replacement of existing storm drains.
<input type="checkbox"/>	21. Maintenance of stormwater treatment features and related infrastructure

Please describe how this project is applicable under Appendix B of the Programmatic Agreement.

The proposed project activities conform to undertakings in Appendix B (minimal potential to cause effects to historical resources): (1) modernization and general highway maintenance that may require additional highway right-of-way or easement including (h) removal of trees as part of highway improvements, (7) Non-Historic bridge and culvert maintenance, renovation, or total replacement and, (9) stream and /or slope stabilization and restoration activities (including removal of debris or sediment obstructing the natural waterway or any non-invasive action to restore natural conditions. Through coordination with the Cultural Resources Program and Department of Historic Resources, it was determined the metal arch corrugated pipe complies with the NH Recordation of Bridges that Apply to the Program Comment for Common Post-1945 Concrete & Steel Bridges and is exempt from eligibility determinations for the National Register of Historic Places. Therefore, it was determined that the proposed project has minimal potential to impact historical resources. Neither the Cultural Resources Program Manager nor the Cultural Resources Program Specialist detected any cultural resources that, based on the project scope, were determined to be likely to be impacted by the project.

Please submit this Certification Form along with the Transportation RPR, including photographs, USGS maps, design plans and as-built plans, if available, for review. Note: The RPR can be waived for in-house projects, please consult Cultural Resources Program Staff.

Coordination Efforts:

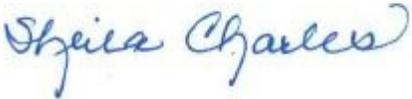
Has an RPR been submitted to NHDOT for this project?	No	NHDHR R&C # assigned?	<u>N/A</u>
Please identify public outreach effort contacts; method of outreach and date:	<u>Initial contact letters were sent to the Madbury conservation commission, fire chief, planning commission, police chief, and chairman of selectmen via mail and Land and Water Conservation Fund Program, Conservation Land Stewardship Program, and Land & Community Heritage Investment Program via email on 9/22/21.</u>		

Finding: (To be filled out by NHDOT Cultural Resources Staff)

<input checked="" type="checkbox"/>	No Potential to Cause Effects	<input type="checkbox"/>	No Historic Properties Affected
This finding serves as the Section 106 Memorandum of Effect. No further coordination is necessary.			

Section 106 Programmatic Agreement – Cultural Resources Review Effect Finding

Appendix B Certification – Activities with Minimal Potential to Cause Effects

<input type="checkbox"/>	This project does <i>not</i> comply with Appendix B. Review will continue under Stipulation VII of the Programmatic Agreement. Please contact NHDOT Cultural Resources Staff to determine next steps.
NHDOT comments:	
	9/22/2021
_____ NHDOT Cultural Resources Staff	_____ Date

Coordination of the Section 106 process should begin as early as possible in the planning phase of the project (undertaking) so as not to cause a delay.

Project sponsors should not predetermine a Section 106 finding under the assumption a project is limited to the activities listed in Appendix B until this form is signed by the NHDOT Bureau of Environment Cultural Resources Program staff.

Every project shall be coordinated with, and reviewed by the NHDOT-BOE Cultural Resources Program in accordance with the *Programmatic Agreement Among the Federal Highway Administration, the New Hampshire State Historic Preservation Office, the Army Corps of Engineers, New England District, the Advisory Council on Historic Preservation, and the New Hampshire Department of Transportation Regarding the Federal Aid Highway Program in New Hampshire*. In accordance with the Advisory Council's regulations, we will continue to consult, as appropriate, as this project proceeds.

If any portion of the project is not entirely limited to any one or a combination of the activities specified in Appendix B (with, or without the inclusion of any activities listed in Appendix A), please continue discussions with NHDOT Cultural Resources staff.

This No Potential to Cause Effect or No Historic Properties Affected project determination is your Section 106 finding, as defined in the Programmatic Agreement.

Should project plans change, please inform the NHDOT Cultural Resources staff in accordance with Stipulation VII of the Programmatic Agreement.

New Hampshire Recordation of Bridges that Apply to the Program Comment for Common Post-1945 Concrete & Steel Bridges

Project Name: Madbury

State Number: 43276 **FHWA Number:** X-A005(068)

Form Completed by: Kerry Ryan **Date:** 9/22/21
Email if not NHDOT staff: [Click here to enter text.](#)



Town	Madbury	NHDOT Bridge No	N/A
Year Built (rebuilt)	1979	Owner	NHDOT
Road carrying	Madbury Road	Over feature	Water, Beard's Creek
Bridge/culvert Type	Elliptical steel-corrugated metal arch pipe	Number of Spans	NA
Length	132'	Width	58"
Abutment style	NA	Pier style	NA

Reviewed by: _____ **Date Reviewed:** 9/22/2021

Shira Charles

NHDOT Cultural Resources Staff

Approved

Not Approved

Justification:

**Complies with Program Comment
& Section 106 PA Appendix B**

RPR Number: _____

Reviewed under PA: X

Rail Type	NA	Rail installation date:	NA
Designer/Engineer (if known)	Chris Carucci	Bridge Plaques or Engravings?	No

Please refer to the *NHDOT Guidance on Using the Program Comment for Common Post-1945 Concrete and Steel Bridges*, located on the NHDOT Bureau of Environment Website, for information on using this form:

<http://www.nh.gov/dot/org/projectdevelopment/environment/units/program-management/cultural.htm>

Information on specific bridges can be found on the NHDOT Bureau of Bridge Design **Bridge Summary** Spreadsheet:

<http://www.nh.gov/dot/org/projectdevelopment/bridgedesign/documents.htm>.

(Additional photographs may be attached here if needed).



**US Army Corps
of Engineers**®
New England District

Appendix B

Regional General Permits (GPs) Required Information and Corps Secondary Impacts Checklist

In order for the Corps of Engineers to properly evaluate your application, applicants must submit the following information along with the New Hampshire DES Wetlands Bureau application or permit notification forms. Some projects may require more information. For a more comprehensive checklist, go to www.nae.usace.army.mil/regulatory, “Forms/Publications” and then “Application and Plan Guideline Checklist.” Check with the Corps at (978) 318-8832 for project-specific requirements. For your convenience, this Appendix B is also attached to the State of New Hampshire DES Wetlands Bureau application and Permit by Notification forms.

All Projects:

- Corps application form ([ENG Form 4345](#)) as appropriate.
- Photographs of wetland/waterway to be impacted.
- Purpose of the project.
- Legible, reproducible black and white (no color) plans no larger than 11”x17” with bar scale. Provide locus map and plan views of the entire property.
- Typical cross-section views of all wetland and waterway fill areas and wetland replication areas.
- In navigable waters, show mean low water (MLW) and mean high water (MHW) elevations. Show the high tide line (HTL) elevations when fill is involved. In other waters, show ordinary high water (OHW) elevation.
- On each plan, show the following for the project:
- Vertical datum and the NAVD 1988 equivalent with the vertical units as U.S. feet. Don’t use local datum. In coastal waters this may be mean higher high water (MHHW), mean high water (MHW), mean low water (MLW), mean lower low water (MLLW) or other tidal datum with the vertical units as U.S. feet. MLLW and MHHW are preferred. Provide the correction factor detailing how the vertical datum (e.g., MLLW) was derived using the latest National Tidal Datum Epoch for that area, typically 1983-2001.
- Horizontal state plane coordinates in U.S. survey feet based on the Traverse Mercator Grid system for the State of New Hampshire (Zone 2800) NAD 83.
- Show project limits with existing and proposed conditions.
- Limits of any Federal Navigation Project in the vicinity of the project area and horizontal State Plane Coordinates in U.S. survey feet for the limits of the proposed work closest to the Federal Navigation Project;
- Volume, type, and source of fill material to be discharged into waters and wetlands, including the area(s) (in square feet or acres) of fill in wetlands, below the ordinary high water in inland waters and below the high tide line in coastal waters.
- Delineation of all waterways and wetlands on the project site,;
- Use Federal delineation methods and include Corps wetland delineation data sheets. See GC 2 and www.nero.noaa.gov/hcd for eelgrass survey guidance.
- GP 3, Moorings, contains eelgrass survey requirements for the placement of moorings.
- For activities involving discharges of dredged or fill material into waters of the U.S., include a statement describing how impacts to waters of the U.S. are to be avoided and minimized, and either a statement describing how impacts to waters of the U.S. are to be compensated for (or a conceptual or detailed mitigation plan) or a statement explaining why compensatory mitigation should not be required for the proposed impacts. Please contact the Corps for guidance.



**US Army Corps
of Engineers**®
New England District

**New Hampshire General Permits (GPs)
Appendix B - Corps Secondary Impacts Checklist
(for inland wetland/waterway fill projects in New Hampshire)**

1. Attach any explanations to this checklist. Lack of information could delay a Corps permit determination.
2. All references to “work” include all work associated with the project construction and operation. Work includes filling, clearing, flooding, draining, excavation, dozing, stumping, etc.
3. See GC 5, regarding single and complete projects.
4. Contact the Corps at (978) 318-8832 with any questions.

1. Impaired Waters	Yes	No
1.1 Will any work occur within 1 mile upstream in the watershed of an impaired water? See http://des.nh.gov/organization/divisions/water/wmb/section401/impaired_waters.htm to determine if there is an impaired water in the vicinity of your work area.*		X
2. Wetlands	Yes	No
2.1 Are there are streams, brooks, rivers, ponds, or lakes within 200 feet of any proposed work?	X	
2.2 Are there proposed impacts to SAS, special wetlands. Applicants may obtain information from the NH Department of Resources and Economic Development Natural Heritage Bureau (NHB) DataCheck Tool for information about resources located on the property at https://www2.des.state.nh.us/nhb_datacheck/ . The book Natural Community Systems of New Hampshire also contains specific information about the natural communities found in NH.		X
2.3 If wetland crossings are proposed, are they adequately designed to maintain hydrology, sediment transport & wildlife passage?	X	
2.4 Would the project remove part or all of a riparian buffer? (Riparian buffers are lands adjacent to streams where vegetation is strongly influenced by the presence of water. They are often thin lines of vegetation containing native grasses, flowers, shrubs and/or trees that line the stream banks. They are also called vegetated buffer zones.)		X
2.5 The overall project site is more than 40 acres?		X
2.6 What is the area of the previously filled wetlands?	Unknown	
2.7 What is the area of the proposed fill in wetlands?	None	
2.8 What is the % of previously and proposed fill in wetlands to the overall project site?	Unknown	
3. Wildlife	Yes	No
3.1 Has the NHB & USFWS determined that there are known occurrences of rare species, exemplary natural communities, Federal and State threatened and endangered species and habitat, in the vicinity of the proposed project? (All projects require an NHB ID number & a USFWS IPAC determination.) NHB DataCheck Tool: https://www2.des.state.nh.us/nhb_datacheck/ USFWS IPAC website: https://ecos.fws.gov/ipac/location/index	X	

3.2 Would work occur in any area identified as either “Highest Ranked Habitat in N.H.” or “Highest Ranked Habitat in Ecological Region”? (These areas are colored magenta and green, respectively, on NH Fish and Game’s map, “2010 Highest Ranked Wildlife Habitat by Ecological Condition.”) Map information can be found at: • PDF: www.wildlife.state.nh.us/Wildlife/Wildlife_Plan/highest_ranking_habitat.htm . • Data Mapper: www.granit.unh.edu . • GIS: www.granit.unh.edu/data/downloadfreedata/category/databycategory.html .		X
3.3 Would the project impact more than 20 acres of an undeveloped land block (upland, wetland/waterway) on the entire project site and/or on an adjoining property(s)?		X
3.4 Does the project propose more than a 10-lot residential subdivision, or a commercial or industrial development?		X
3.5 Are stream crossings designed in accordance with the GC 21?	X	
4. Flooding/Floodplain Values	Yes	No
4.1 Is the proposed project within the 100-year floodplain of an adjacent river or stream?		X
4.2 If 4.1 is yes, will compensatory flood storage be provided if the project results in a loss of flood storage?		
5. Historic/Archaeological Resources		
For a minimum, minor or major impact project - a copy of the Request for Project Review (RPR) Form (www.nh.gov/nhdhr/review) with your DES file number shall be sent to the NH Division of Historical Resources as required on Page 11 GC 8(d) of the GP document**	X	

*Although this checklist utilizes state information, its submittal to the Corps is a Federal requirement.

** If your project is not within Federal jurisdiction, coordination with NH DHR is not required under Federal law.

Supplemental Information:

2.6 & 2.8 - The amount of fill previously placed in wetlands is unknown. Based on archive plans and estimated width of the stream channel, previous fill in wetlands was about 0.06 acres.

5. - Project qualifies for Section 106 Programmatic Agreement, Appendix B



By NHDOT Highway Design 5/6/2021

Culvert inlet

Channel: Wetland #4 (R2UBH)- Impact Area B

Left of inlet: Wetland #5 (BANK) – Impact Area C Right of inlet: Wetland #6 (PFO1E) – Impact Area A



By NHDOT Highway Design 5/6/2021

Culvert inlet, looking upstream

Left of inlet and along woods line: Wetland #6 (PFO1E) - Impact Area A

Right of inlet: Wetland #4 (R2UBH)- Impact Area B and Wetland #5 (BANK) – Impact Area C



By NHDOT Bureau of Environment 5/28/2021

Culvert inlet side, looking downstream, showing missing / detached invert and dent in lower left side



By NHDOT Highway Design 9/2020

Culvert inlet side, downstream of damaged portion, showing heavy rust and some perforations
Shape still intact



By NHDOT Highway Design 5/6/2021

Beards Creek, at culvert inlet looking upstream

Left of Channel: Wetland #6 (PFO1E) - Impact Area A

Channel: Wetland #4 (R2UBH)- Impact Area B Right of Channel: Wetland #5 (BANK) – Impact Area C



By NHDOT Bureau of Environment 5/28/2021

Culvert outlet side, looking north. Small trees along outlet channel to be cleared.



By NHDOT Bureau of Environment 5/28/2021

Culvert outlet, looking upstream

Channel: Wetland #7 (R2UBH) - Impact Area F

Bank Left: Wetland #9 (BANK) – Impact Area E Bank Right: Wetland #8 (BANK) – Impact Area D



By NHDOT Bureau of Environment 5/28/2021

Culvert outlet, showing small amount of sediment inside, approx 2" thick



Madbury Road, looking south towards project area



Madbury Road, looking north

Madbury 43276

CONSTRUCTION SEQUENCE

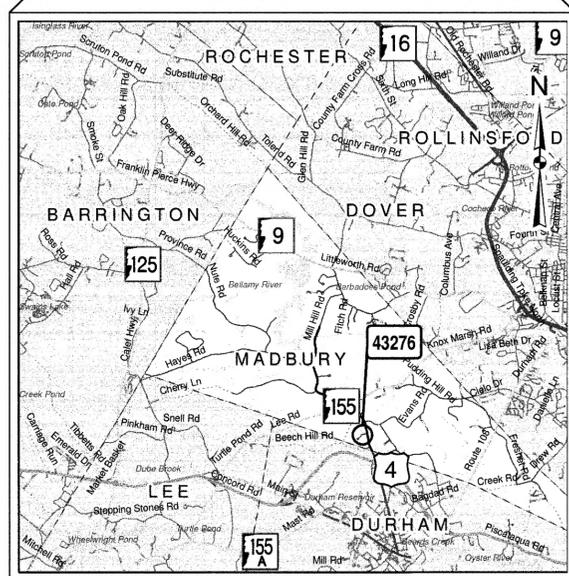
Dewatering basins, water diversion structures, and other temporary measures shown on the Erosion Control Plans are approximate. Type, size, and location will be as per the Contractor's approved SWPPP.

1. Perform any necessary clearing operations for access and staging.
2. Install perimeter sediment controls and install necessary temporary erosion controls as specified on the strategies sheet. Include all staging areas. Set up dewatering basin.
3. Stabilize construction entrances at access points from Madbury Road using stone over geotextile or other approved method.
4. Install water diversion at inlet and other sedimentation controls/BMP's as needed.
5. Clean water bypass shall be through the existing pipe, unless otherwise approved as part of the Contractor's SWPPP.
6. Clean and inspect existing pipe.
7. Remove approximately 7' of the existing pipe at the inlet end.
8. Construct inlet headwall and the section of simulated stream channel up to subgrade.
9. Prepare existing pipe for lining, grout any voids around outside of pipe.
10. Insert pipe liner, grout annular space between liner and existing pipe.
11. Fill any sinkholes on inlet and outlet embankment slopes.
12. Construct backfill and final grading around inlet headwall, place humus and surface layer of simulated streambed material.
13. Place seed, mulch, and erosion control matting (where steeper than 4:1) on newly graded areas.
14. Remove water diversion, and re-establish flow through the culvert.
15. Repair any rutting on embankment slopes, remove temporary construction entrances.
16. Stabilize any remaining disturbed areas with seed, mulch, and temporary slope matting (where steeper than 4:1). Seed placed in jurisdictional wetland areas shall be a wetland seed mix.
17. Remove erosion and sediment controls once the site is stabilized.

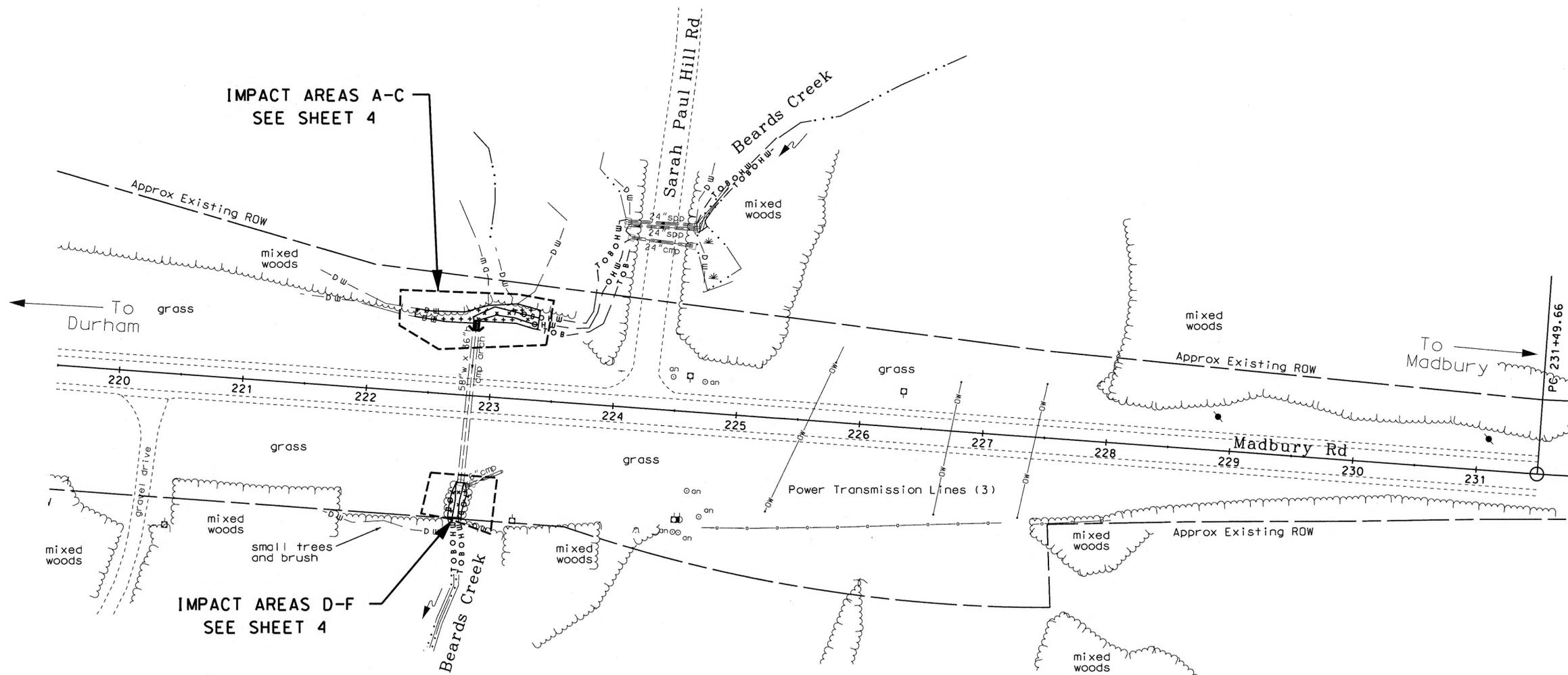
STATE OF NEW HAMPSHIRE
DEPARTMENT OF TRANSPORTATION
WETLANDS PLANS
FEDERAL AID PROJECT

X-A005(068)
N.H. PROJECT NO. 43276
MADBURY ROAD

DESIGN DATA	
AVERAGE DAILY TRAFFIC 20_19	5,177
AVERAGE DAILY TRAFFIC 20_XX	N/A
PERCENT OF TRUCKS	3%
DESIGN SPEED	N/A
LENGTH OF PROJECT	CULVERT 131 LF



1 1/2 0 1 2 Miles
LOCATION MAP



IMPACT AREAS A-C
SEE SHEET 4

IMPACT AREAS D-F
SEE SHEET 4

INDEX OF SHEETS

- 1 FRONT SHEET
- 2-3 STANDARD SYMBOLS SHEETS
- 4 WETLAND IMPACT PLAN
- 5 PROFILES
- 6 DETAILS
- 7 EROSION CONTROL STRATEGIES
- 8 EROSION CONTROL PLAN

Wetland Delineation per ENV-Wt 406 by:
NHDOT (Sarah Large & Deidra Benjamin)
May 27, 2021

TOWN OF MADBURY
COUNTY OF STRAFFORD

SCALE: 1" = 50'

Plans Prepared by:
Christopher Carucci, PE

DATE 11/18/2021

Per Wetland Plans Rule(s)
Env-Wt 311.05



NHDOT THE STATE OF
NEW HAMPSHIRE
DEPARTMENT OF
TRANSPORTATION

Madbury Road
Culvert Rehabilitation
Wetland Impact and
Erosion Control Plans

FEDERAL PROJECT NO.	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
X-A005(068)	43276	1	8

FOR CONSTRUCTION AND ALIGNMENT DETAILS - SEE CONSTRUCTION PLANS

DRAWN BY JJJ
CHECKED BY CAC
DATE 9/2021
DATE 11/18/21

GENERAL

EDGE OF PAVEMENT TRAVELED WAY			
DRIVEWAYS			
BUILDINGS			
FOUNDATIONS			
LEACH FIELD			
BRIDGE CROSSINGS			
STEPS AND WALK			
INTERMITTENT WATER COURSE			
SHORE LINE			
POTENTIAL WET AREA SYMBOL			
BRUSH OR WOODS LINE			
TREES (PLANS)			
TREE OR STUMP (CROSS-SECTIONS)			
HEDGE			
MONITORING WELL			
WELL			
FLAG POLE			

ORIGINAL GROUND (TYPICALS)		
ROCK OUTCROP		
ROCK LINE (TYPICALS & SECTIONS ONLY)		
GUARDRAIL (label type)		
JERSEY BARRIER		
CURB (LABEL TYPE)		
STONE WALL		
RETAINING WALL (LABEL TYPE)		
FENCE (LABEL TYPE)		
SIGNS		
GAS PUMP		
FUEL TANK (ABOVE GROUND)		
STORAGE TANK FILLER CAP		
SEPTIC TANK		
GRAVE		
MAILBOX		
VENT PIPE		
SATELLITE DISH ANTENNA		
PHONE		
GROUND LIGHT/LAMP POST		
BORING LOCATION		
TEST PIT		
INTERSTATE NUMBERED HIGHWAY		
UNITED STATES NUMBERED HIGHWAY		
STATE NUMBERED HIGHWAY		

SHORELAND - WETLAND

WETLAND DESIGNATION AND TYPE	
DELINEATED WETLAND	
ORDINARY HIGH WATER	
TOP OF BANK	
TOP OF BANK & ORDINARY HIGH WATER	
NORMAL HIGH WATER	
WIDTH AT BANK FULL	
PRIME WETLAND	
PRIME WETLAND 100' BUFFER	
NON-JURISDICTIONAL DRAINAGE AREA	
COWARDIN DISTINCTION LINE	
TIDAL BUFFER ZONE	
DEVELOPED TIDAL BUFFER ZONE	
HIGHEST OBSERVABLE TIDE LINE	
MEAN HIGH WATER	
MEAN LOW WATER	
VERNAL POOL	
SPECIAL AQUATIC SITE	
REFERENCE LINE	
WATER FRONT BUFFER	
NATURAL WOODLAND BUFFER	
PROTECTED SHORELAND	
INVASIVE SPECIES LABEL	
INVASIVE SPECIES	

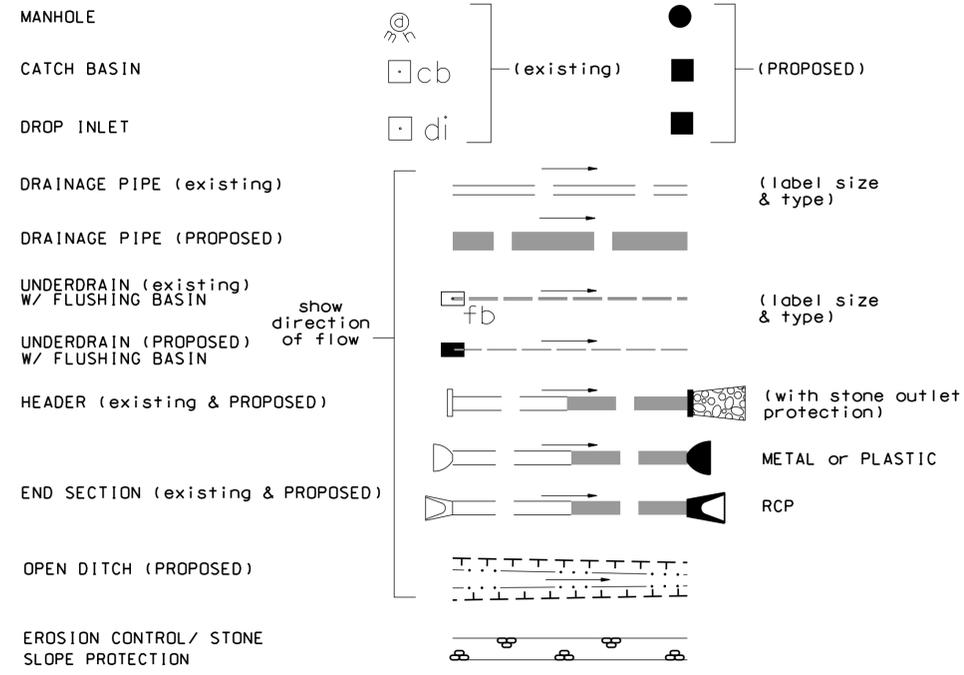
FLOODPLAIN / FLOODWAY

500 YEAR FLOODPLAIN BOUNDARY	
100 YEAR FLOODPLAIN BOUNDARY	
FLOODWAY	

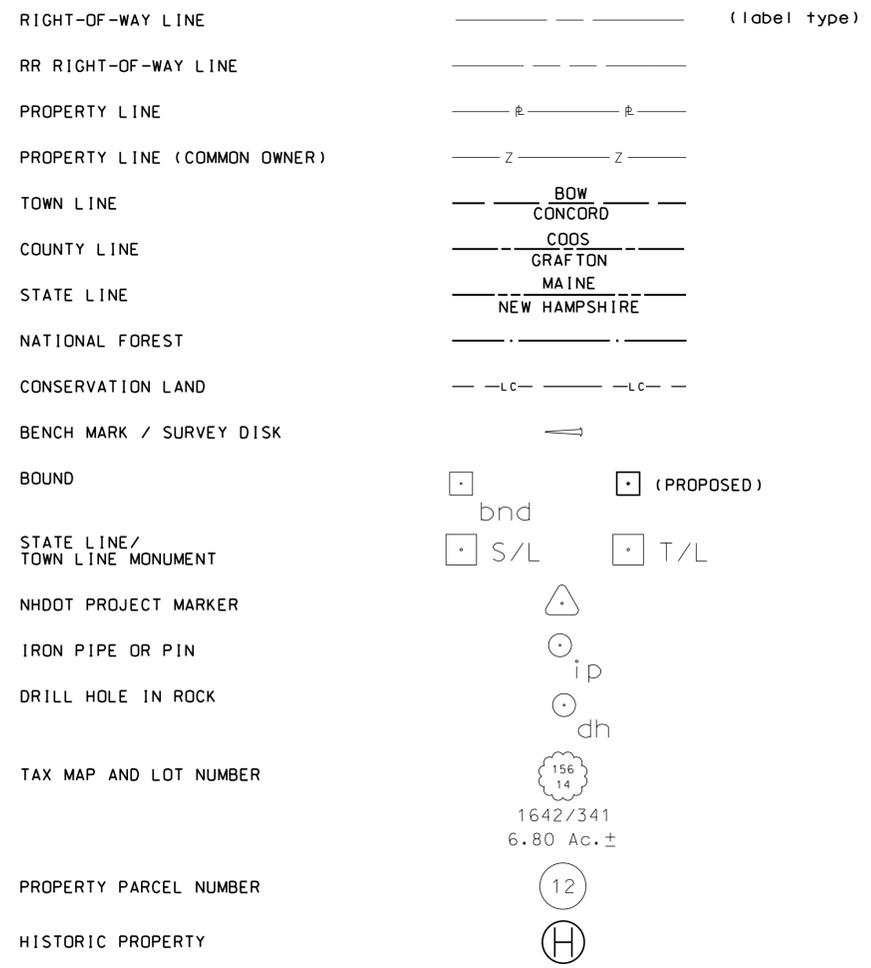
ENGINEERING

CONSTRUCTION BASELINE	
PC, PT, POT (ON CONST BASELINE)	
PI (IN CONSTRUCTION BASELINES)	
INTERSECTION OR EQUATION OF TWO LINES	
ORIGINAL GROUND LINE (PROFILES AND CROSS-SECTIONS)	
PROFILE GRADE LINE (PROFILES AND CROSS-SECTIONS)	
CLEARING LINE	
SLOPE LINE	
SLOPE LINE (FILL)	
SLOPE LINE (CUT)	
PROFILES AND CROSS SECTIONS:	
ORIGINAL GROUND ELEVATION (LEFT)	
FINISHED GRADE ELEVATION (RIGHT)	

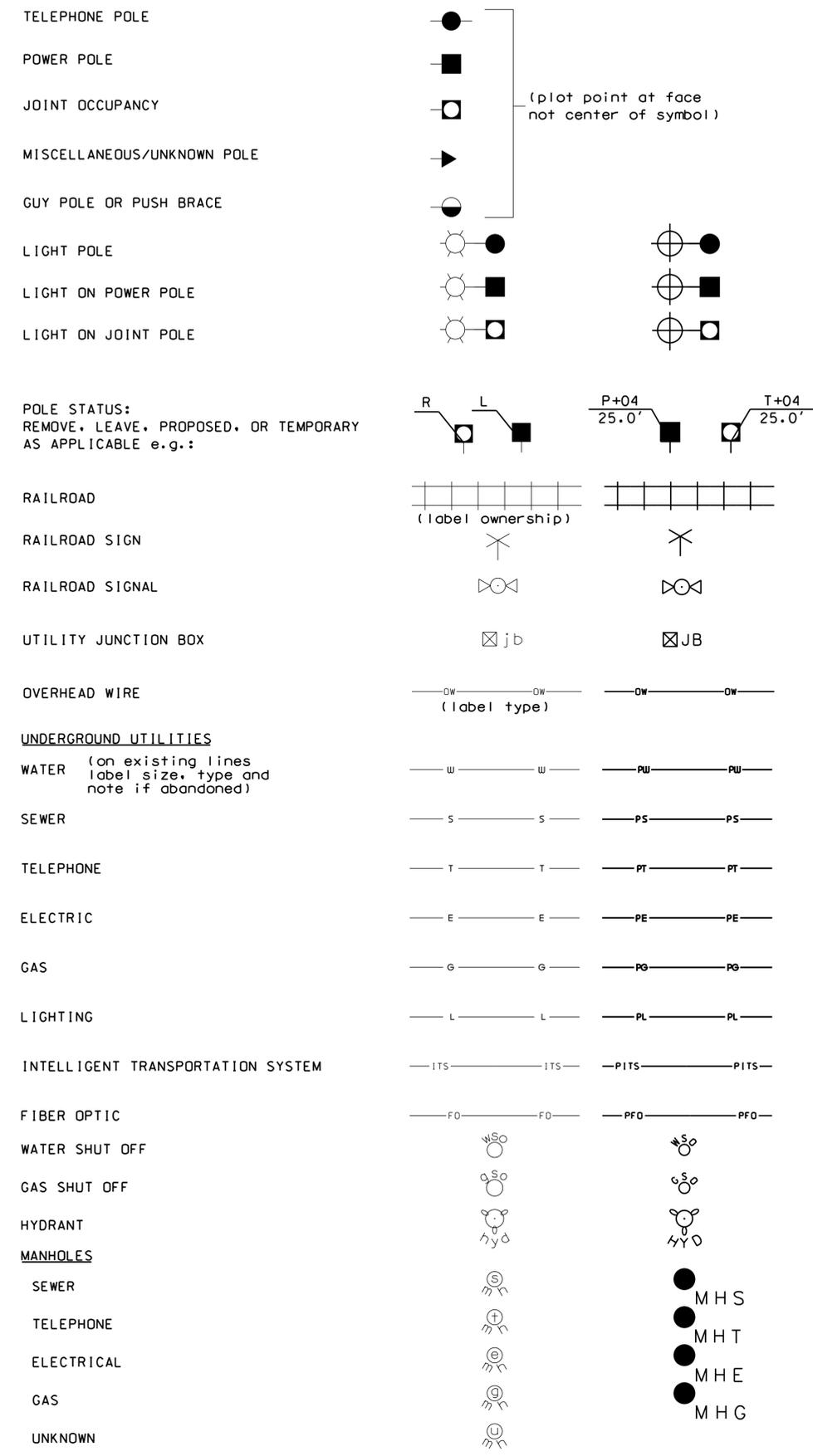
DRAINAGE



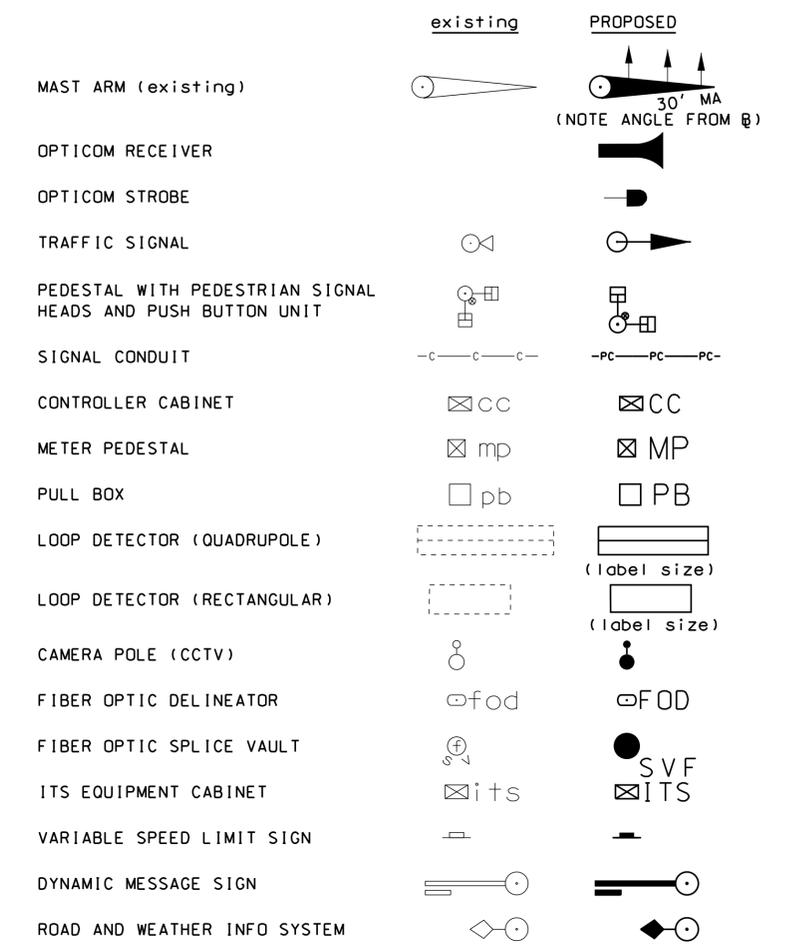
BOUNDARIES / RIGHT-OF-WAY



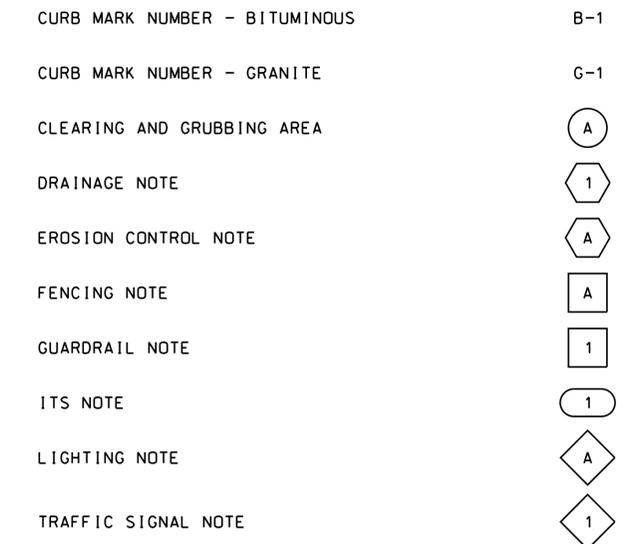
UTILITIES



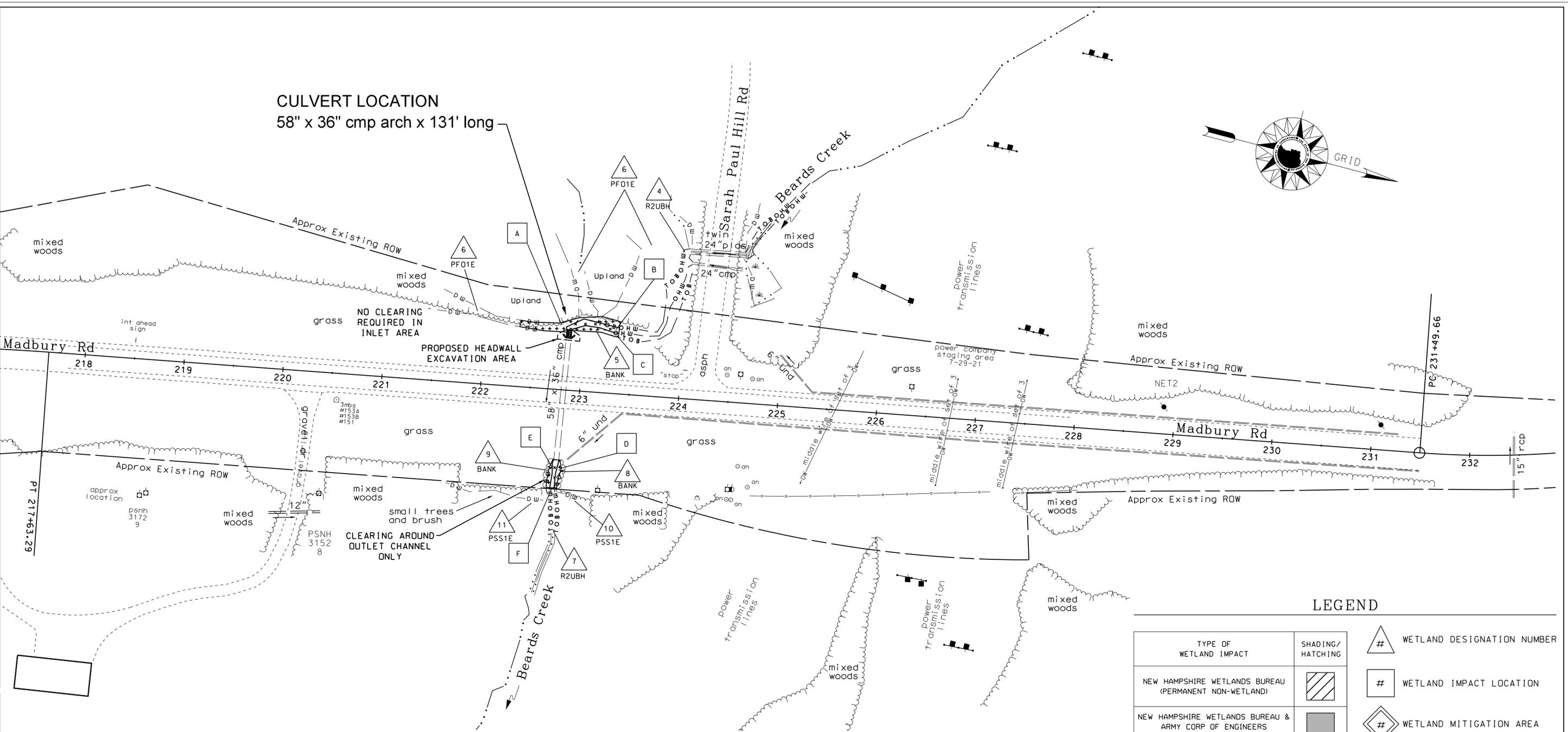
TRAFFIC SIGNALS / ITS



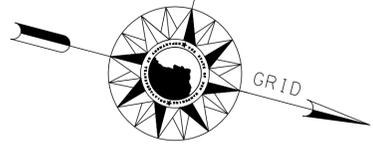
CONSTRUCTION NOTES



SDR PROCESSED	SEL	DATE	6/2021
NEW DESIGN	CAC	DATE	8/2021
SHEET CHECKED	JUN	DATE	9/2021
AS BUILT DETAILS		DATE	



CULVERT LOCATION
58" x 36" cmp arch x 131' long



LEGEND

TYPE OF WETLAND IMPACT	SHADING/HATCHING	#	WETLAND DESIGNATION NUMBER
NEW HAMPSHIRE WETLANDS BUREAU (PERMANENT NON-WETLAND)	[Diagonal Hatching]	#	WETLAND IMPACT LOCATION
NEW HAMPSHIRE WETLANDS BUREAU & ARMY CORP OF ENGINEERS (PERMANENT WETLAND)	[Solid Grey]	#	WETLAND MITIGATION AREA
TEMPORARY IMPACTS	[Cross-hatching]	[Diagonal Hatching]	MITIGATION

WETLAND NUMBER	WETLAND CLASSIFICATION	LOCATION	AREA IMPACTS						LINEAR STREAM IMPACTS FOR MITIGATION		
			PERMANENT			TEMPORARY			PERMANENT		
			N.H.W.B. (NON-WETLAND)	N.H.W.B. & A.C.O.E. (WETLAND)		TEMPORARY		BANK LEFT	BANK RIGHT	CHANNEL	
6	PFO1E	A	---	---	---	---	644	---	---	---	
4	R2UBH	B	---	---	---	---	291	54	---	---	
5	BANK	C	---	---	---	---	193	48	---	---	
8	BANK	D	---	---	---	---	91	29	---	---	
9	BANK	E	---	---	---	---	92	29	---	---	
7	R2UBH	F	---	---	---	---	125	29	---	---	
TOTAL			0	0	0	0	1436	189	0	0	0

PERMANENT IMPACTS: 0 SF
 TEMPORARY IMPACTS: 1,436 SF
 TOTAL IMPACTS: 1,436 SF

WETLAND CLASSIFICATION CODES	
R2UBH	RIVERINE, LOWER PERENNIAL, UNCONSOLIDATED BOTTOM, PERMANENTLY FLOODED
BANK	BANK
PSS1E	PALUSTRINE, SCRUB-SHRUB, PERSISTENT, SEASONALLY FLOODED/SATURATED
PFO1E	PALUSTRINE, FORESTED, BROAD-LEAVED DECIDUOUS, SEASONALLY FLOODED/SATURATED

STA 222+83.6
 REHABILITATE EXISTING 58" X 36" X 131' LONG CORRUGATED METAL CULVERT:
 REMOVE 7 LF OF PIPE AT INLET, CONSTRUCT HEADWALL.
 SLIPLINE REMAINING 124 LF OF PIPE WITH CORRUGATED METAL PIPE LINER.
 MATCH NEW INLET END TO CHANNEL WITH SIMULATED STREAMBED MATERIAL.
 RESTORE DISTURBED AREAS TO EXISTING CONDITIONS. USE WETLAND SEED MIX TO RESTORE JURISDICTIONAL WETLAND AREAS.



SEE PROFILE FOR CULVERT SLOPE AND INVERTS

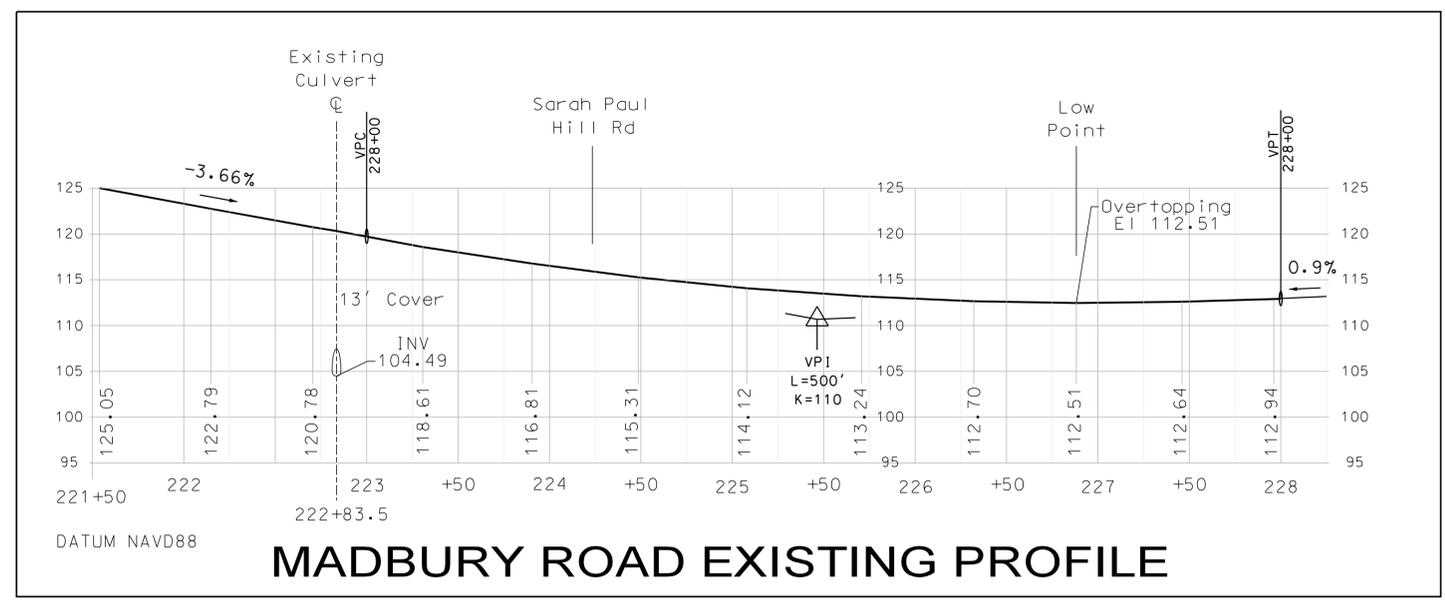
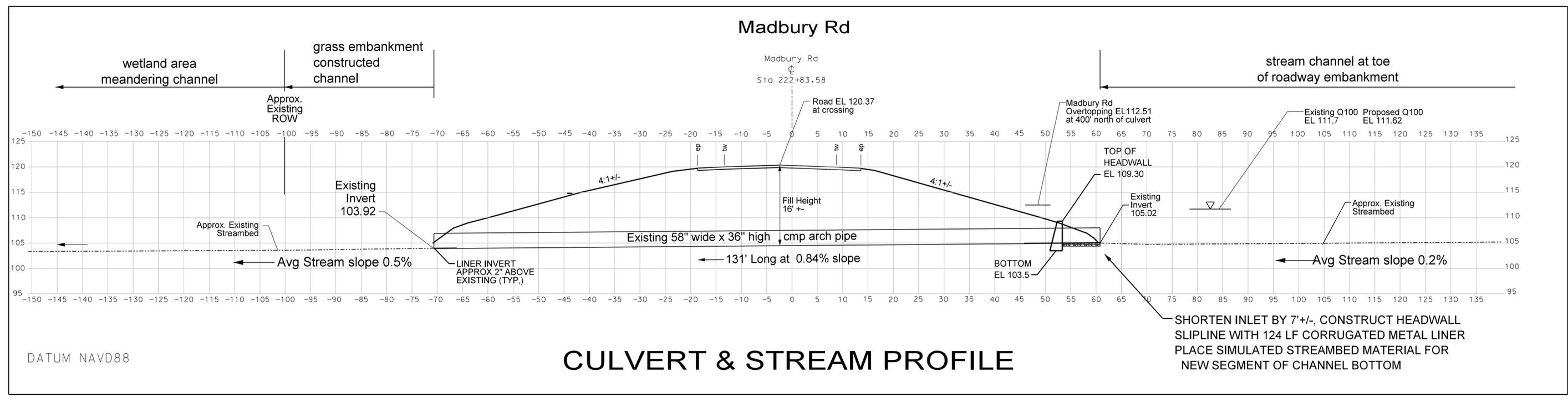
STATE OF NEW HAMPSHIRE
 MADBURY
 DEPARTMENT OF TRANSPORTATION • BUREAU OF HIGHWAY DESIGN

WETLAND IMPACT PLAN

DGN	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
43276wetplans	43276	4	8

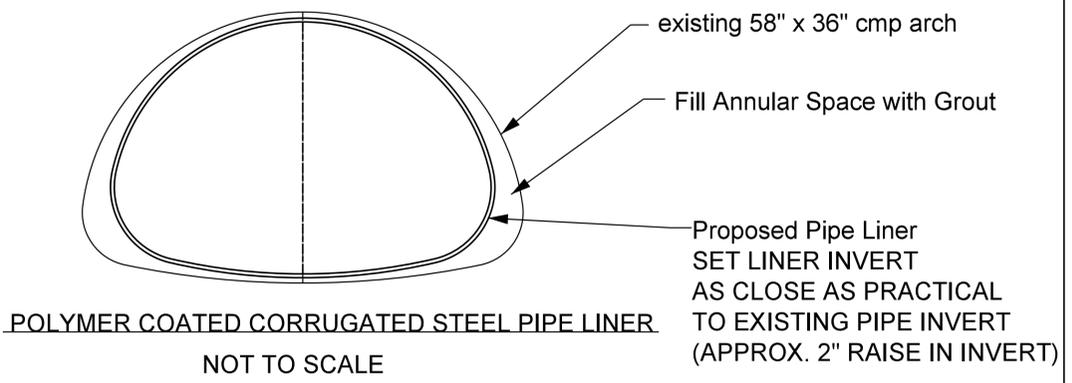
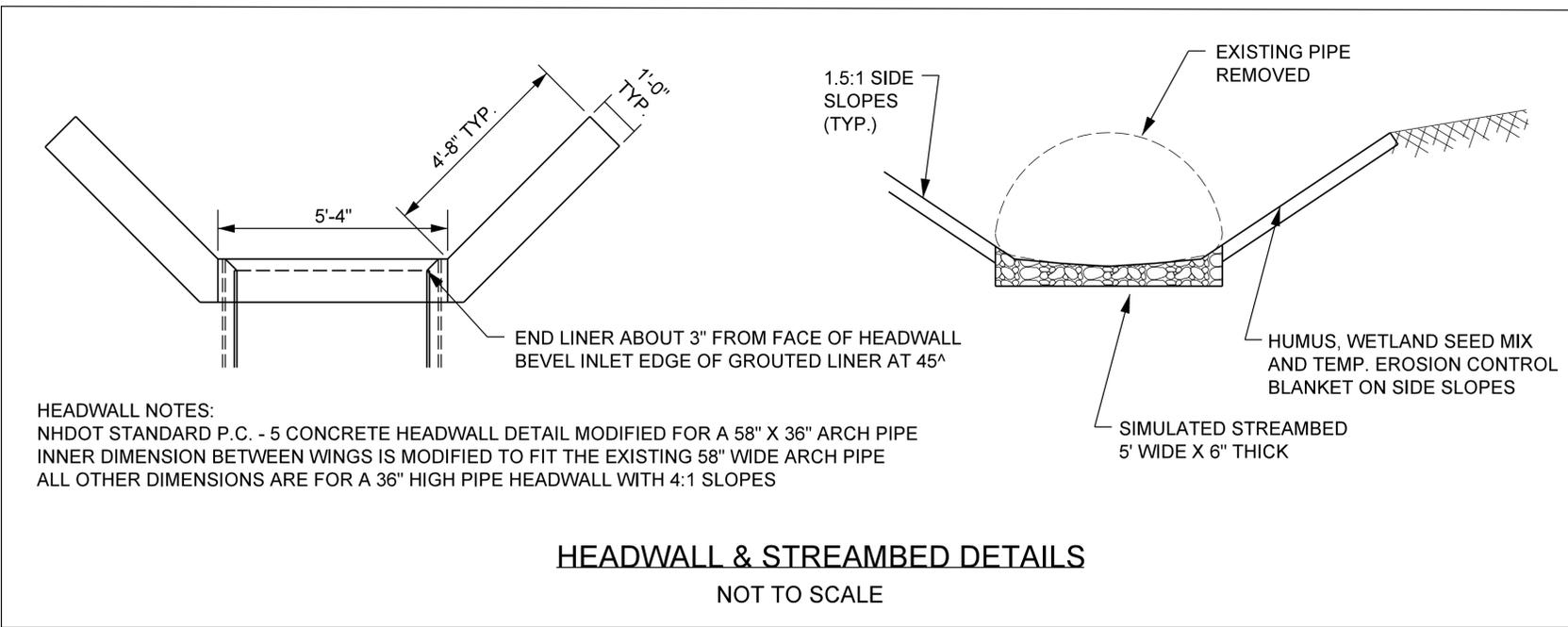
SDR PROCESSED	SEL	DATE	6/2021
NEW DESIGN	CAC	DATE	8/2021
SHEET CHECKED	JUN	DATE	9/2021
AS BUILT DETAILS		DATE	

REVISIONS AFTER PROPOSAL	DESCRIPTION	STATION



STATE OF NEW HAMPSHIRE			
MADBURY			
DEPARTMENT OF TRANSPORTATION • BUREAU OF HIGHWAY DESIGN			
PROFILES			
DGN	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
43276profile_pipe	43276	5	8

SDR PROCESSED	DATE	DATE	DATE	DATE	DATE
NEW DESIGN	JUN	10/2021			
SHEET CHECKED	NAME3				
AS BUILT DETAILS					

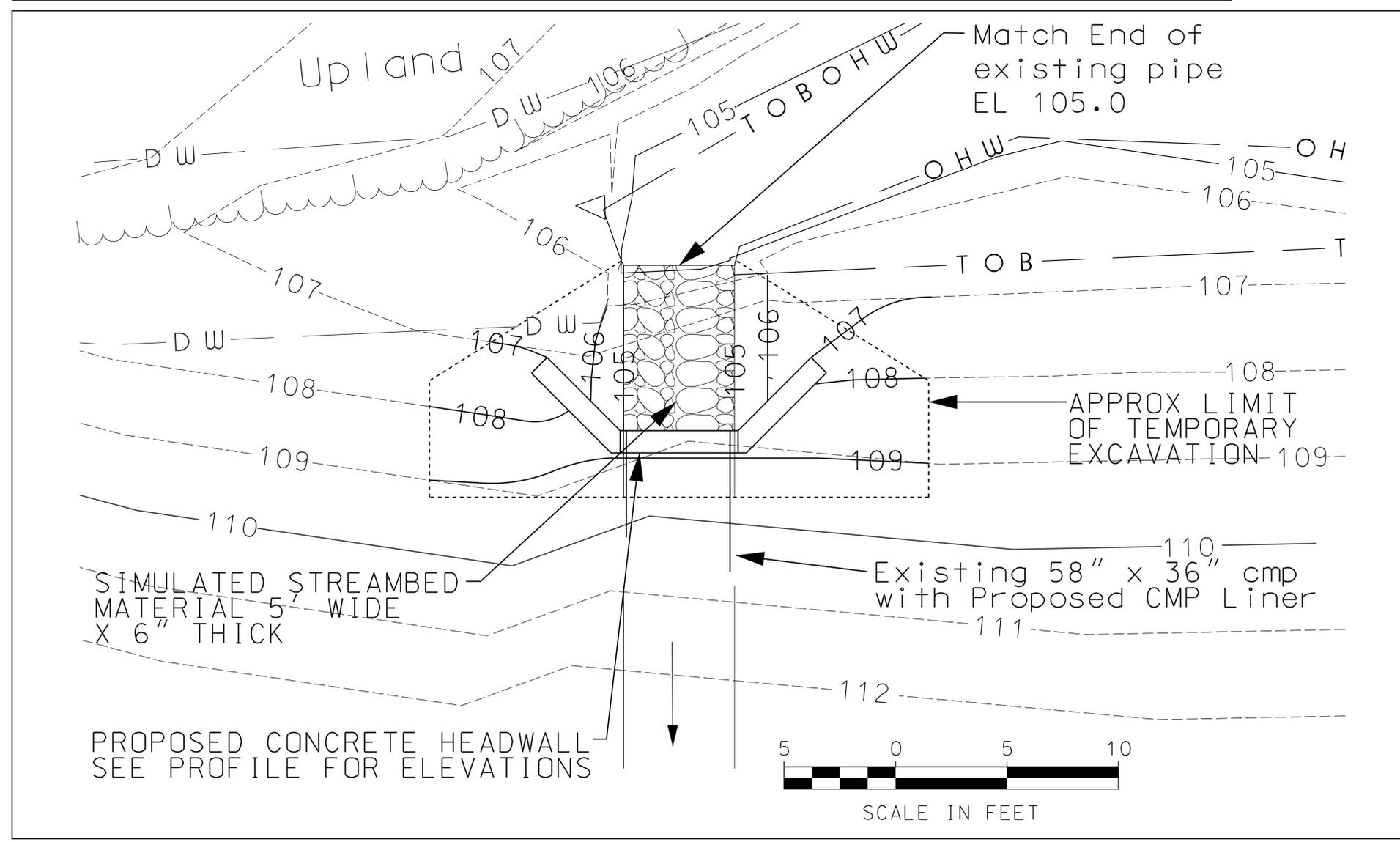


Existing Pipe Nominal Dimensions

58" X 36" cmp arch, 10 gage
 Length 131' +/-
 inside perimeter 12.66'
 span = 57.8"
 rise = 35.5"
 Tr = 29.12"
 Br = 115.69"
 Cr = 7"
 Area = 11.23 SF

Proposed Liner Dimensions

49" X 33" CMP ARCH, 12 gage
 POLYMER COATED
 SPAN = 49.0"
 RISE = 33.0"
 Tr = 25.125"
 Br = 77.25"
 Cr = 9.625"
 n = .018
 AREA = 8.90SF



STATE OF NEW HAMPSHIRE MADBURY			
DEPARTMENT OF TRANSPORTATION • BUREAU OF HIGHWAY DESIGN			
DRAINAGE DETAILS			
DGN	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
43276profile_pipe	43276	6	8

EROSION CONTROL STRATEGIES

1. ENVIRONMENTAL COMMITMENTS:
 - 1.1. THESE GUIDELINES DO NOT RELIEVE THE CONTRACTOR FROM COMPLIANCE WITH ANY CONTRACT PROVISIONS, OR APPLICABLE FEDERAL, STATE, AND LOCAL REGULATIONS.
 - 1.2. THIS PROJECT WILL BE SUBJECT TO THE US EPA'S NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) STORM WATER CONSTRUCTION GENERAL PERMIT AS ADMINISTERED BY THE ENVIRONMENTAL PROTECTION AGENCY (EPA). THIS PROJECT IS SUBJECT TO REQUIREMENTS IN THE MOST RECENT CONSTRUCTION GENERAL PERMIT (CGP).
 - 1.3. THE CONTRACTOR'S ATTENTION IS DIRECTED TO THE NHDES WETLAND PERMIT, THE US ARMY CORPS OF ENGINEERS PERMIT, WATER QUALITY CERTIFICATION AND THE SPECIAL ATTENTION ITEMS INCLUDED IN THE CONTRACT DOCUMENTS.
 - 1.4. ALL STORM WATER, EROSION AND SEDIMENT CONTROL MEASURES SHALL BE INSTALLED AND MAINTAINED IN ACCORDANCE WITH THE NEW HAMPSHIRE STORMWATER MANUAL, VOLUME 3, EROSION AND SEDIMENT CONTROLS DURING CONSTRUCTION (DECEMBER 2008) (BMP MANUAL) AVAILABLE FROM THE NEW HAMPSHIRE DEPARTMENT OF ENVIRONMENTAL SERVICES (NHDES).
 - 1.5. THE CONTRACTOR SHALL COMPLY WITH RSA 485-A:17, AND ALL, PUBLISHED NHDES ALTERATION OF TERRAIN ENV-WO 1500 REQUIREMENTS ([HTTP://DES.NH.GOV/ORGANIZATION/COMMISSIONER/LEGAL/RULES/INDEX.HTM](http://des.nh.gov/organization/commissioner/legal/rules/index.htm))
 - 1.6. THE CONTRACTOR IS DIRECTED TO REVIEW AND COMPLY WITH SECTION 107.1 OF THE CONTRACT AS IT REFERS TO SPILLAGE, AND ALSO WITH REGARDS TO EROSION, POLLUTION, AND TURBIDITY PRECAUTIONS.
2. STANDARD EROSION CONTROL SEQUENCING APPLICABLE TO ALL CONSTRUCTION PROJECTS:
 - 2.1. PERIMETER CONTROLS SHALL BE INSTALLED PRIOR TO EARTH DISTURBING ACTIVITIES. PERIMETER CONTROLS AND STABILIZED CONSTRUCTION EXITS SHALL BE INSTALLED AS SHOWN IN THE BMP MANUAL AND AS DIRECTED BY THE STORMWATER POLLUTION PREVENTION PLAN (SWPPP) PREPARER.
 - 2.2. EROSION, SEDIMENTATION CONTROL MEASURES AND INFILTRATION BASINS SHALL BE CLEANED, REPLACED AND AUGMENTED AS NECESSARY TO PREVENT SEDIMENTATION BEYOND PROJECT LIMITS THROUGHOUT THE PROJECT DURATION.
 - 2.3. EROSION AND SEDIMENT CONTROL MEASURES SHALL BE INSPECTED IN ACCORDANCE WITH THE CONSTRUCTION GENERAL PERMIT AND SECTION 645 OF THE NHDOT SPECIFICATIONS FOR ROAD AND BRIDGES CONSTRUCTION.
 - 2.4. AN AREA SHALL BE CONSIDERED STABLE IF ONE OF THE FOLLOWING HAS OCCURRED:
 - (A) BASE COURSE GRAVELS HAVE BEEN INSTALLED IN AREAS TO BE PAVED;
 - (B) A MINIMUM OF 85% VEGETATED GROWTH HAS BEEN ESTABLISHED;
 - (C) A MINIMUM OF 3" OF NON-EROSIVE MATERIAL SUCH AS STONE OR RIP-RAP HAS BEEN INSTALLED;
 - (D) TEMPORARY SLOPE STABILIZATION CONFORMING TO TABLE 1 HAS BEEN PROPERLY INSTALLED
 - 2.5. ALL STOCKPILES SHALL BE CONTAINED WITH A PERIMETER CONTROL. IF THE STOCKPILE IS TO REMAIN UNDISTURBED FOR MORE THAN 14 DAYS, MULCHING WILL BE REQUIRED.
 - 2.6. A WATER TRUCK SHALL BE AVAILABLE TO CONTROL EXCESSIVE DUST AT THE DIRECTION OF THE CONTRACT ADMINISTRATOR.
 - 2.7. TEMPORARY EROSION AND SEDIMENTATION CONTROL MEASURES SHALL REMAIN UNTIL THE AREA HAS BEEN PERMANENTLY STABILIZED.
 - 2.8. CONSTRUCTION PERFORMED ANY TIME BETWEEN NOVEMBER 30th AND MAY 1st OF ANY YEAR SHALL BE CONSIDERED WINTER CONSTRUCTION AND SHALL CONFORM TO THE FOLLOWING REQUIREMENTS.
 - (A) ALL PROPOSED VEGETATED AREAS WHICH DO NOT EXHIBIT A MINIMUM OF 85% VEGETATIVE GROWTH BY OCTOBER 15th, OR WHICH ARE DISTURBED AFTER OCTOBER 15th, SHALL BE STABILIZED IN ACCORDANCE WITH TABLE 1.
 - (B) ALL DITCHES OR SWALES WHICH DO NOT EXHIBIT A MINIMUM OF 85% VEGETATIVE GROWTH BY OCTOBER 15th, OR WHICH ARE DISTURBED AFTER OCTOBER 15th, SHALL BE STABILIZED TEMPORARILY WITH STONE OR IN ACCORDANCE WITH TABLE 1.
 - (C) AFTER NOVEMBER 30th INCOMPLETE ROAD SURFACES, WHERE WORK HAS STOPPED FOR THE SEASON, SHALL BE PROTECTED IN ACCORDANCE WITH TABLE 1.
 - (D) WINTER EXCAVATION AND EARTHWORK SHALL BE DONE SUCH THAT NO MORE THAN 1 ACRE OF THE PROJECT IS WITHOUT STABILIZATION AT ONE TIME, UNLESS A WINTER CONSTRUCTION PLAN HAS BEEN APPROVED BY NHDOT THAT MEETS THE REQUIREMENTS OF ENV-WO 1505.02 AND ENV-WO 1505.05.
 - (E) A SWPPP AMENDMENT SHALL BE SUBMITTED TO THE DEPARTMENT, FOR APPROVAL, ADDRESSING COLD WEATHER STABILIZATION (ENV-WO 1505.05) AND INCLUDING THE REQUIREMENTS OF NO LESS THAN 30 DAYS PRIOR TO THE COMMENCEMENT OF WORK SCHEDULED AFTER NOVEMBER 30th.

GENERAL CONSTRUCTION PLANNING AND SELECTION OF STRATEGIES TO CONTROL EROSION AND SEDIMENT ON HIGHWAY CONSTRUCTION PROJECTS

3. PLAN ACTIVITIES TO ACCOUNT FOR SENSITIVE SITE CONDITIONS:
 - 3.1. CLEARLY FLAG AREAS TO BE PROTECTED IN THE FIELD AND PROVIDE CONSTRUCTION BARRIERS TO PREVENT TRAFFICKING OUTSIDE OF WORK AREAS.
 - 3.2. CONSTRUCTION SHALL BE SEQUENCED TO LIMIT THE DURATION AND AREA OF EXPOSED SOILS.
 - 3.3. PROTECT AND MAXIMIZE EXISTING NATIVE VEGETATION AND NATURAL FOREST BUFFERS BETWEEN CONSTRUCTION ACTIVITY AND SENSITIVE AREAS.
 - 3.4. WHEN WORK IS PERFORMED IN AND NEAR WATER COURSES, STREAM FLOW DIVERSION METHODS SHALL BE IMPLEMENTED PRIOR TO ANY EXCAVATION OR FILLING.
 - 3.5. WHEN WORK IS PERFORMED WITHIN 50 FEET OF SURFACE WATERS (WETLAND, OPEN WATER OR FLOWING WATER), PERIMETER CONTROL SHALL BE ENHANCED CONSISTENT WITH SECTION 2.1.2.1. OF THE 2012 NPDES CONSTRUCTION GENERAL PERMIT.
4. MINIMIZE THE AMOUNT OF EXPOSED SOIL:
 - 4.1. CONSTRUCTION SHALL BE SEQUENCED TO LIMIT THE DURATION AND AREA OF EXPOSED SOILS. MINIMIZE THE AREA OF EXPOSED SOIL AT ANY ONE TIME. PHASING SHALL BE USED TO REDUCE THE AMOUNT AND DURATION OF SOIL EXPOSED TO THE ELEMENTS AND VEHICLE TRACKING.
 - 4.2. UTILIZE TEMPORARY MULCHING OR PROVIDE ALTERNATE TEMPORARY STABILIZATION ON EXPOSED SOILS IN ACCORDANCE WITH TABLE 1.
 - 4.3. THE MAXIMUM AMOUNT OF DISTURBED EARTH SHALL NOT EXCEED A TOTAL OF 5 ACRES FROM MAY 1st THROUGH NOVEMBER 30th, OR EXCEED ONE ACRE DURING WINTER MONTHS, UNLESS THE CONTRACTOR DEMONSTRATES TO THE DEPARTMENT THAT THE ADDITIONAL AREA OF DISTURBANCE IS NECESSARY TO MEET THE CONTRACTORS CRITICAL PATH METHOD SCHEDULE (CPM), AND THE CONTRACTOR HAS ADEQUATE RESOURCES AVAILABLE TO ENSURE THAT ENVIRONMENTAL COMMITMENTS WILL BE MET.
5. CONTROL STORMWATER FLOWING ONTO AND THROUGH THE PROJECT:
 - 5.1. DIVERT OFF SITE RUNOFF OR CLEAN WATER AWAY FROM THE CONSTRUCTION ACTIVITY TO REDUCE THE VOLUME THAT NEEDS TO BE TREATED ON SITE.
 - 5.2. DIVERT STORM RUNOFF FROM UPSLOPE DRAINAGE AREAS AWAY FROM DISTURBED AREAS, SLOPES, AND AROUND ACTIVE WORK AREAS AND TO A STABILIZED OUTLET LOCATION.
 - 5.3. CONSTRUCT IMPERMEABLE BARRIERS AS NECESSARY TO COLLECT OR DIVERT CONCENTRATED FLOWS FROM WORK OR DISTURBED AREAS.
 - 5.4. STABILIZE, TO APPROPRIATE ANTICIPATED VELOCITIES, CONVEYANCE CHANNELS OR PUMPING SYSTEMS NEEDED TO CONVEY CONSTRUCTION STORMWATER TO BASINS AND DISCHARGE LOCATIONS PRIOR TO USE.
 - 5.5. DIVERT OFF-SITE WATER THROUGH THE PROJECT IN AN APPROPRIATE MANNER SO NOT TO DISTURB THE UPSTREAM OR DOWNSTREAM SOILS, VEGETATION OR HYDROLOGY BEYOND THE PERMITTED AREA.
6. PROTECT SLOPES:
 - 6.1. INTERCEPT AND DIVERT STORM RUNOFF FROM UPSLOPE DRAINAGE AREAS AWAY FROM UNPROTECTED AND NEWLY ESTABLISHED AREAS AND SLOPES TO A STABILIZED OUTLET OR CONVEYANCE.
 - 6.2. CONSIDER HOW GROUNDWATER SEEPAGE ON CUT SLOPES MAY IMPACT SLOPE STABILITY AND INCORPORATE APPROPRIATE MEASURES TO MINIMIZE EROSION.
 - 6.3. CONVEY STORMWATER DOWN THE SLOPE IN A STABILIZED CHANNEL OR SLOPE DRAIN.
 - 6.4. THE OUTER FACE OF THE FILL SLOPE SHOULD BE IN A LOOSE RUFFLED CONDITION PRIOR TO TURF ESTABLISHMENT. TOPSOIL OR HUMUS LAYERS SHALL BE TRACKED UP AND DOWN THE SLOPE, DISKED, HARROWED, DRAGGED WITH A CHAIN OR MAT, MACHINE-RAKED, OR HAND-WORKED TO PRODUCE A RUFFLED SURFACE.
7. ESTABLISH STABILIZED CONSTRUCTION EXITS:
 - 7.1. INSTALL AND MAINTAIN CONSTRUCTION EXITS, ANYWHERE TRAFFIC LEAVES A CONSTRUCTION SITE ONTO A PUBLIC RIGHT-OF-WAY.
 - 7.2. SWEEP ALL CONSTRUCTION RELATED DEBRIS AND SOIL FROM THE ADJACENT PAVED ROADWAYS AS NECESSARY.
8. PROTECT STORM DRAIN INLETS:
 - 8.1. DIVERT SEDIMENT LADEN WATER AWAY FROM INLET STRUCTURES TO THE EXTENT POSSIBLE.
 - 8.2. INSTALL SEDIMENT BARRIERS AND SEDIMENT TRAPS AT INLETS TO PREVENT SEDIMENT FROM ENTERING THE DRAINAGE SYSTEM.
 - 8.3. CLEAN CATCH BASINS, DRAINAGE PIPES, AND CULVERTS IF SIGNIFICANT SEDIMENT IS DEPOSITED.
 - 8.4. DROP INLET SEDIMENT BARRIERS SHOULD NEVER BE USED AS THE PRIMARY MEANS OF SEDIMENT CONTROL AND SHOULD ONLY BE USED TO PROVIDE AN ADDITIONAL LEVEL OF PROTECTION TO STRUCTURES AND DOWN-GRADIENT SENSITIVE RECEPTORS.
9. SOIL STABILIZATION:
 - 9.1. WITHIN THREE DAYS OF THE LAST ACTIVITY IN AN AREA, ALL EXPOSED SOIL AREAS, WHERE CONSTRUCTION ACTIVITIES ARE COMPLETE, SHALL BE STABILIZED.
 - 9.2. IN ALL AREAS, TEMPORARY SOIL STABILIZATION MEASURES SHALL BE APPLIED IN ACCORDANCE WITH THE STABILIZATION REQUIREMENTS (SECTION 2.2) OF THE 2012 CGP. (SEE TABLE 1 FOR GUIDANCE ON THE SELECTION OF TEMPORARY SOIL STABILIZATION MEASURES.)
 - 9.3. EROSION CONTROL SEED MIX SHALL BE SOWN IN ALL INACTIVE CONSTRUCTION AREAS THAT WILL NOT BE PERMANENTLY SEEDED WITHIN TWO WEEKS OF DISTURBANCE AND PRIOR TO SEPTEMBER 15, OF ANY GIVEN YEAR. IN ORDER TO ACHIEVE VEGETATIVE STABILIZATION PRIOR TO THE END OF THE GROWING SEASON.
 - 9.4. SOIL TACKIFIERS MAY BE APPLIED IN ACCORDANCE WITH THE MANUFACTURER'S SPECIFICATIONS AND REAPPLIED AS NECESSARY TO MINIMIZE SOIL AND MULCH LOSS UNTIL PERMANENT VEGETATION IS ESTABLISHED.
10. RETAIN SEDIMENT ON-SITE AND CONTROL DEWATERING PRACTICES:
 - 10.1. TEMPORARY SEDIMENT BASINS (CGP-SECTION 2.1.3.2) OR SEDIMENT TRAPS (ENV-WO 1506.10) SHALL BE SIZED TO RETAIN, ON SITE, THE VOLUME OF A 2-YEAR 24-HOUR STORM EVENT FOR ANY AREA OF DISTURBANCE OR 3,600 CUBIC FEET OF STORMWATER RUNOFF PER ACRE OF DISTURBANCE, WHICHEVER IS GREATER. TEMPORARY SEDIMENT BASINS USED TO TREAT STORMWATER RUNOFF FROM AREAS GREATER THAN 5-ACRES OF DISTURBANCE SHALL BE SIZED TO ALSO CONTROL STORMWATER RUNOFF FROM A 10-YEAR 24 HOUR STORM EVENT. ON-SITE RETENTION OF THE 10-YEAR 24-HOUR EVENT IS NOT REQUIRED.
 - 10.2. CONSTRUCT AND STABILIZE DEWATERING INFILTRATION BASINS PRIOR TO ANY EXCAVATION THAT MAY REQUIRE DEWATERING.
 - 10.3. TEMPORARY SEDIMENT BASINS OR TRAPS SHALL BE PLACED AND STABILIZED AT LOCATIONS WHERE CONCENTRATED FLOW (CHANNELS AND PIPES) DISCHARGE TO THE SURROUNDING ENVIRONMENT FROM AREAS OF UNSTABILIZED EARTH DISTURBING ACTIVITIES.

11. ADDITIONAL EROSION AND SEDIMENT CONTROL GENERAL PRACTICES:
 - 11.1. USE TEMPORARY MULCHING, PERMANENT MULCHING, TEMPORARY VEGETATIVE COVER, AND PERMANENT VEGETATIVE COVER TO REDUCE THE NEED FOR DUST CONTROL. USE MECHANICAL SWEEPERS ON PAVED SURFACES WHERE NECESSARY TO PREVENT DUST BUILDUP. APPLY WATER, OR OTHER DUST INHIBITING AGENTS OR TACKIFIERS, AS APPROVED BY THE NHDES.
 - 11.2. ALL STOCKPILES SHALL BE CONTAINED WITH TEMPORARY PERIMETER CONTROLS. INACTIVE SOIL STOCKPILES SHOULD BE PROTECTED WITH SOIL STABILIZATION MEASURES (TEMPORARY EROSION CONTROL SEED MIX AND MULCH, SOIL BINDER) OR COVERED WITH ANCHORED TARPS.
 - 11.3. EROSION AND SEDIMENT CONTROL MEASURES WILL BE INSPECTED IN ACCORDANCE WITH SECTION 645 OF NHDOT SPECIFICATIONS. WEEKLY AND WITHIN 24 HOURS AFTER ANY STORM EVENT GREATER THAN 0.25 IN. OF RAIN PER 24-HOUR PERIOD. EROSION AND SEDIMENT CONTROL MEASURES WILL ALSO BE INSPECTED IN ACCORDANCE WITH THE GUIDANCE MEMO FROM THE NHDES CONTAINED WITHIN THE CONTRACT PROPOSAL AND THE EPA CONSTRUCTION GENERAL PERMIT.
 - 11.4. THE CONTRACTOR SHOULD UTILIZE STORM DRAIN INLET PROTECTION TO PREVENT SEDIMENT FROM ENTERING A STORM DRAINAGE SYSTEM PRIOR TO THE PERMANENT STABILIZATION OF THE CONTRIBUTING DISTURBED AREA.
 - 11.5. PERMANENT STABILIZATION MEASURES WILL BE CONSTRUCTED AND MAINTAINED IN LOCATIONS AS SHOWN ON THE CONSTRUCTION PLANS TO STABILIZE AREAS. VEGETATIVE STABILIZATION SHALL NOT BE CONSIDERED PERMANENTLY STABILIZED UNTIL VEGETATIVE GROWTH COVERS AT LEAST 85% OF THE DISTURBED AREA. THE CONTRACTOR SHALL BE RESPONSIBLE FOR EROSION AND SEDIMENT CONTROL FOR ONE YEAR AFTER PROJECT COMPLETION.
 - 11.6. CATCH BASINS: CARE SHALL BE TAKEN TO ENSURE THAT SEDIMENTS DO NOT ENTER ANY EXISTING CATCH BASINS DURING CONSTRUCTION. THE CONTRACTOR SHALL PLACE TEMPORARY STONE INLET PROTECTION OVER INLETS IN AREAS OF SOIL DISTURBANCE THAT ARE SUBJECT TO SEDIMENT CONTAMINATION.
 - 11.7. TEMPORARY AND PERMANENT DITCHES SHALL BE CONSTRUCTED, STABILIZED AND MAINTAINED IN A MANNER THAT WILL MINIMIZE SCOUR. TEMPORARY AND PERMANENT DITCHES SHALL BE DIRECTED TO DRAIN TO SEDIMENT BASINS OR STORM WATER COLLECTION AREAS.
 - 11.8. WINTER EXCAVATION AND EARTHWORK ACTIVITIES NEED TO BE LIMITED IN EXTENT AND DURATION, TO MINIMIZE POTENTIAL EROSION AND SEDIMENTATION IMPACTS. THE AREA OF EXPOSED SOIL SHALL BE LIMITED TO ONE ACRE, OR THAT WHICH CAN BE STABILIZED AT THE END OF EACH DAY UNLESS A WINTER CONSTRUCTION PLAN, DEVELOPED BY A QUALIFIED ENGINEER OR A CPESC SPECIALIST, IS REVIEWED AND APPROVED BY THE DEPARTMENT.
 - 11.9. CHANNEL PROTECTION MEASURES SHALL BE SUPPLEMENTED WITH PERIMETER CONTROL MEASURES WHEN THE DITCH LINES OCCUR AT THE BOTTOM OF LONG FILL SLOPES. THE PERIMETER CONTROLS SHALL BE INSTALLED ON THE FILL SLOPE TO MINIMIZE THE POTENTIAL FOR FILL SLOPE SEDIMENT DEPOSITS IN THE DITCH LINE.

BEST MANAGEMENT PRACTICES (BMP) BASED ON AMOUNT OF OPEN CONSTRUCTION AREA

12. STRATEGIES SPECIFIC TO OPEN AREAS LESS THAN 5 ACRES:
 - 12.1. THE CONTRACTOR SHALL COMPLY WITH RSA 485:A:17 AND ENV-WO 1500; ALTERATION OF TERRAIN FOR CONSTRUCTION AND USE ALL CONVENTIONAL BMP STRATEGIES.
 - 12.2. SLOPES STEEPER THAN 3:1 WILL RECEIVE TURF ESTABLISHMENT WITH MATTING.
 - 12.3. SLOPES 3:1 OR FLATTER WILL RECEIVE TURF ESTABLISHMENT ALONE.
 - 12.4. AREAS WHERE HAUL ROADS ARE CONSTRUCTED AND STORMWATER CANNOT BE TREATED THE DEPARTMENT WILL CONSIDER INFILTRATION.
 - 12.5. FOR HAUL ROADS ADJACENT TO SENSITIVE ENVIRONMENTAL AREAS OR STEEPER THAN 5%, THE DEPARTMENT WILL CONSIDER USING EROSION STONE, CRUSHED GRAVEL, OR CRUSHED STONE BASE TO HELP MINIMIZE EROSION ISSUES.
 - 12.6. ALL AREAS THAT CAN BE STABILIZED SHALL BE STABILIZED PRIOR TO OPENING UP NEW TERRITORY.
 - 12.7. DETENTION BASINS SHALL BE DESIGNED AND CONSTRUCTED TO ACCOMMODATE A 2 YEAR STORM EVENT.
13. STRATEGIES SPECIFIC TO OPEN AREAS BETWEEN 5 AND 10 ACRES:
 - 13.1. THE CONTRACTOR SHALL COMPLY WITH RSA 485:A:17 AND ENV-WO 1500 ALTERATION OF TERRAIN AND SHALL USE CONVENTIONAL BMP STRATEGIES AND ALL TREATMENT OPTIONS USED FOR UNDER 5 ACRES WILL BE UTILIZED.
 - 13.2. DETENTION BASINS WILL BE CONSTRUCTED TO ACCOMMODATE THE 2-YEAR 24-HOUR STORM EVENT AND CONTROL A 10-YEAR 24-HOUR STORM EVENT.
 - 13.3. SLOPES STEEPER THAN A 3:1 WILL RECEIVE TURF ESTABLISHMENT WITH MATTING OR OTHER TEMPORARY SOIL STABILIZATION MEASURES DETAILED IN TABLE 1. THE CONTRACTOR MAY ALSO CONSIDER A SOIL BINDER IN ACCORDANCE WITH THE NHDES APPROVALS OR REGULATIONS. OTHER ALTERNATIVE MEASURES, SUCH AS BONDED FIBER MATRIXES (BFMS) OR FLEXIBLE GROWTH MEDIUMS (FGMS) MAY BE UTILIZED, IF MEETING THE NHDES APPROVALS AND REGULATIONS.
 - 13.4. SLOPES 3:1 OR FLATTER WILL RECEIVE TURF ESTABLISHMENT OR OTHER TEMPORARY SOIL STABILIZATION MEASURES DETAILED IN TABLE 1. THE CONTRACTOR MAY ALSO CONSIDER A SOIL BINDER IN ACCORDANCE WITH THE NHDES APPROVALS OR REGULATIONS.
14. STRATEGIES SPECIFIC TO OPEN AREAS OVER 10 ACRES:
 - 14.1. THE CONTRACTOR SHALL COMPLY WITH RSA 485:A:17 AND ENV-WO 1500 ALTERATION OF TERRAIN AND SHALL USE CONVENTIONAL BMP STRATEGIES AND ALL TREATMENT OPTIONS USED FOR UNDER 5 ACRES AND BETWEEN 5 AND 10 ACRES WILL BE UTILIZED.
 - 14.2. THE DEPARTMENT ANTICIPATES THAT SOIL BINDERS WILL BE NEEDED ON ALL SLOPES STEEPER THAN 3:1, IN ORDER TO MINIMIZE EROSION AND REDUCE THE AMOUNT OF SEDIMENT IN THE STORMWATER TREATMENT BASINS.
 - 14.3. THE CONTRACTOR WILL BE REQUIRED TO HAVE AN APPROVED DESIGN IN ACCORDANCE WITH ENV-WO 1506.12 FOR AN ACTIVE FLOCCULANT TREATMENT SYSTEM TO TREAT AND RELEASE WATER CAPTURED IN STORM WATER BASINS. THE CONTRACTOR SHALL ALSO RETAIN THE SERVICES OF AN ENVIRONMENTAL CONSULTANT WHO HAS DEMONSTRATED EXPERIENCE IN THE DESIGN OF FLOCCULANT TREATMENT SYSTEMS. THE CONSULTANT WILL ALSO BE RESPONSIBLE FOR THE IMPLEMENTATION AND MONITORING OF THE SYSTEM.

TABLE 1
GUIDANCE ON SELECTING TEMPORARY SOIL STABILIZATION MEASURES

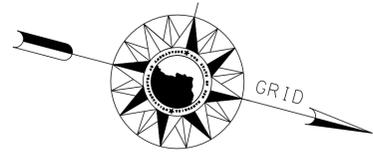
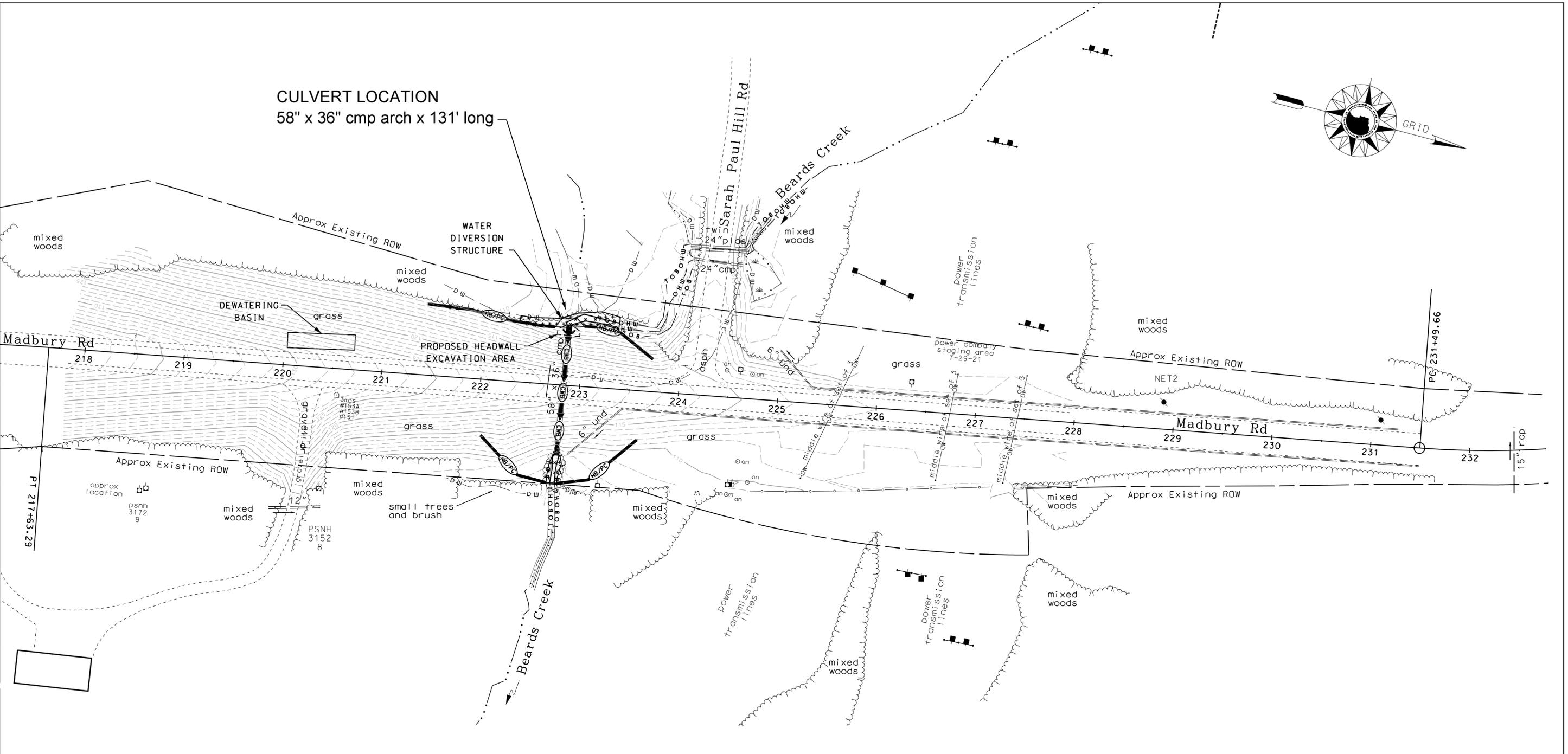
APPLICATION AREAS	DRY MULCH METHODS				HYDRAULICALLY APPLIED MULCHES ²				ROLLED EROSION CONTROL BLANKETS ³			
	HMT	WC	SG	CB	HM	SMM	BFM	FRM	SNSB	DNSB	DNCSB	DNCB
SLOPES ¹												
STEEPER THAN 2:1	NO	NO	YES	NO	NO	NO	NO	YES	NO	NO	NO	YES
2:1 SLOPE	YES	YES	YES	YES	NO	NO	YES	YES	NO	YES	YES	YES
3:1 SLOPE	YES	YES	YES	YES	NO	YES	YES	YES	YES	YES	YES	NO
4:1 SLOPE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	NO	NO
WINTER STABILIZATION	4T/AC	YES	YES	YES	NO	NO	YES	YES	YES	YES	YES	YES
CHANNELS												
LOW FLOW CHANNELS	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	YES	YES
HIGH FLOW CHANNELS	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	YES

ABBREV.	STABILIZATION MEASURE	ABBREV.	STABILIZATION MEASURE	ABBREV.	STABILIZATION MEASURE
HMT	HAY MULCH & TACK	HM	HYDRAULIC MULCH	SNSB	SINGLE NET STRAW BLANKET
WC	WOOD CHIPS	SMM	STABILIZED MULCH MATRIX	DNSB	DOUBLE NET STRAW BLANKET
SG	STUMP GRINDINGS	BFM	BONDED FIBER MATRIX	DNCSB	2 NET STRAW-COCONUT BLANKET
CB	COMPOST BLANKET	FRM	FIBER REINFORCED MEDIUM	DNCB	2 NET COCONUT BLANKET

- NOTES:
1. ALL SLOPE STABILIZATION OPTIONS ASSUME A SLOPE LENGTH ≤ 10 TIMES THE HORIZONTAL DISTANCE COMPONENT OF THE SLOPE, IN FEET.
 2. PRODUCTS CONTAINING POLYACRYLAMIDE (PAM) SHALL NOT BE APPLIED DIRECTLY TO OR WITHIN 100 FEET OF ANY SURFACE WATER WITHOUT PRIOR WRITTEN APPROVAL FROM THE NH DEPARTMENT OF ENVIRONMENTAL SERVICES.
 3. ALL EROSION CONTROL BLANKETS SHALL BE MADE WITH WILDLIFE FRIENDLY BIODEGRADABLE NETTING.

STATE OF NEW HAMPSHIRE				
MADBURY				
DEPARTMENT OF TRANSPORTATION • BUREAU OF HIGHWAY DESIGN				
<i>EROSION CONTROL STRATEGIES</i>				
REVISION DATE	DGN	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
12-21-2015	43276erosstrat	43276	7	8

SDR PROCESSED	SEL	DATE	6/2021
NEW DESIGN	CAC	DATE	8/2021
SHEET CHECKED	JUN	DATE	9/2021
AS BUILT DETAILS		DATE	



EROSION CONTROL PLAN LEGEND	
	PERIMETER CONTROL SILT FENCE EROSION CONTROL MIX BERM EROSION CONTROL MIX SOX TURBIDITY CURTAIN SHEET PILE COFFER DAM
	NATURAL BUFFER/PERIMETER CONTROL SILT FENCE EROSION CONTROL MIX BERM EROSION CONTROL MIX SOX TURBIDITY CURTAIN SHEET PILE COFFER DAM
	CHANNEL PROTECTION STONE CHECK DAMS STRAW WATTLES CHANNEL MATTING CLASS D EROSION STONE CLASS C STONE
	CLEAN WATER BYPASS PUMP THROUGH PIPE DRAIN THROUGH PIPE OR CHANNEL

STA 222+83.6:
 REHABILITATE EXISTING 58" X 36" X 131' LONG CORRUGATED METAL CULVERT:
 REMOVE 7 LF OF PIPE AT INLET, CONSTRUCT HEADWALL.
 SLIPLINE REMAINING 124 LF OF PIPE WITH CORRUGATED METAL PIPE LINER.
 MATCH NEW INLET END TO CHANNEL WITH SIMULATED STREAMBED MATERIAL.
 RESTORE DISTURBED AREAS TO EXISTING CONDITIONS. USE WETLAND SEED
 MIX TO RESTORE JURISDICTIONAL WETLAND AREAS.

COFFERDAM, WATER DIVERSION, AND DEWATERING BASIN SIZES AND LOCATIONS ARE APPROXIMATE. FINAL TYPE/SIZE/LOCATION SHALL BE PER CONTRACTOR'S APPROVED SWPPP.

NO CHANGE TO EXISTING TOPOGRAPHY EXCEPT FOR AREA IMMEDIATELY AROUND PROPOSED INLET HEADWALL. SEE DETAIL FOR PROPOSED CONTOURS.

NHDOT SURVEY, NAVD88 DATUM
 CONTOUR INTERVAL 1 FOOT



SEE PROFILE FOR CULVERT SLOPE AND INVERTS			
STATE OF NEW HAMPSHIRE MADBURY			
DEPARTMENT OF TRANSPORTATION • BUREAU OF HIGHWAY DESIGN			
EROSION CONTROL PLAN			
DGN	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
43276ercplans	43276	8	8